Oct. 30, 1945. E. W. SCOTT 2,388,090

ELECTRODE ASSEMBLY

Filed June 22, 1944

Fig. 1.

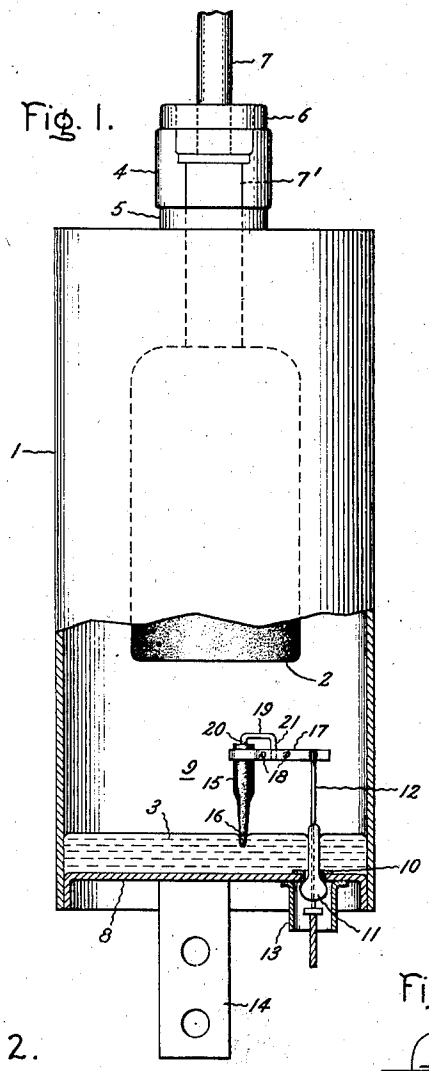


Fig. 2.

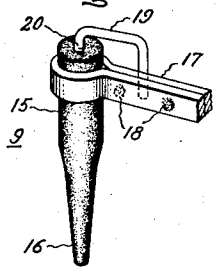
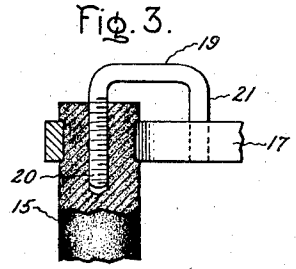


Fig. 3.



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ELECTRODE ASSEMBLY

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6 Claims. (Cl. 250—27.5)

My invention relates to electrode assemblies and more particularly to an improved starting electrode assembly adapted for use with electric discharge devices employing a pool-type cathode.

Electric discharge devices employing a cathode of conducting liquid and a starting electrode having a portion of relatively high resistance material immersed in the liquid have been widely used, particularly where large currents are handled. Considerable trouble has been experienced with the starting electrode assemblies formerly used in devices of this character. In one form the starting electrode assembly includes a support and supply conductor in the form of a metal strap which is bent around the end of the starting electrode at the end thereof remote from the cathode. The ends of the strap extend laterally from the starting electrode and are spot welded together to close the loop tightly about the electrode. While this construction has given reasonably good service, there has been a tendency for the electrode to become loose in the holder after prolonged service, particularly in installations where high operating temperatures, such as 800° to 1000° C. are encountered. Even where the holder is formed of a metal having a low thermal coefficient of expansion, such as fernico, the difference in expansion between the electrode and the holder at the temperatures encountered is sufficient to loosen the holder from the electrode. It is believed that this initial loosening due to expansion is aggravated by deterioration of the electrode, in the region of the support, resulting from small arcs which form between the holder and the electrode. As soon as appreciable loosening occurs, the starting action of the electrode becomes erratic and replacement of the electrode assembly is required. In accordance with the teachings of my invention, I provide an improved electrode structure, of the type described above, in which the tendency of the electrode to become loose in the holder is eliminated.

It is an object of my invention to provide a new and improved electrode assembly.

It is another object of my invention to provide a new and improved holder for the starting electrode of an electric discharge device.

It is a still further object of my invention to provide an improved starting electrode assembly for electric discharge devices of the mercury pool type which is characterized by long life and consistent operating characteristics.

For a better understanding of my invention, reference may be had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims. In the drawing, Fig. 1 illustrates my invention applied to an electric discharge device of the mercury-pool type; Fig. 2 is an enlarged view in perspective of my improved electrode holder, and Fig. 3 is an enlarged view, partially in section, showing the details of construction of my improved electrode assembly.

Referring now to the drawing, I have shown my invention embodied in an electric discharge device comprising a metal cylindrical envelope 1 within which is supported an anode 2 of graphite or other suitable material. The anode is generally cylindrical in form and has the lower face thereof supported in opposed relation to a cathode 3 which comprises a pool of conducting liquid such as mercury. The anode is supported in insulated relation with respect to the envelope 1 by means of a seal construction including a glass sleeve 4 which is sealed to an upstanding flange 5 supported on the upper end of the envelope 1. The upper end of the sleeve 4 is closed by a metal cap 6 to which is secured an anode lead-in conductor 7. It will be understood that the anode 2 is supported from the cover 6 by a connecting stud 7'.

The lower end of the envelope 1 is closed by a header 8 which may be resistance welded to the walls of the envelope 1. A starting electrode 9 is provided with the lower end thereof immersed in the cathode for the purpose of initiating a cathode spot when it is desired to initiate conduction by the electric discharge device. The tip of the electrode 9 may be any one of a number of the high resistance compositions which have been employed for this purpose and preferably comprises a mixture of high resistance materials such as boron carbide and boron nitride. The starting electrode is supported in insulated relation with respect to the envelope 1 by a suitable seal construction including a metal eyelet 10 which is welded to the header 8 and a body of glass 11 which is bonded to the eyelet and to a supporting and lead-in conductor 12. The body of glass, as illustrated in Fig. 1, extends above the level of the cathode 3, and an eyelet 13 of larger diameter than eyelet 10 is welded to the lower side of the header 8 to protect the seal. A current supply conductor for the cathode is provided by a heavy terminal 14 secured to the header 8.

The electrode assembly of my invention is illus-

trated in more detail in Fig. 2. As illustrated in Fig. 2, the starting electrode 9 includes a cylindrical shank portion 15 which may be formed of graphite and a starting tip 16 which is formed of a high resistance material or a mixture of such materials. Near the upper end of the shank is provided a circumferential recess to receive the holder 17 which, as illustrated, is formed from a flat strip of metal which is wrapped about the shank and has the ends spot welded together at 18. In order to improve the mechanical strength of the connection between the holder and the starting electrode and to prevent the formation of small arcs between the holder and the shank of the starting electrode, particularly at high operating temperatures, I provide an additional connection between the starting electrode and the arms of the holder. As illustrated in Fig. 2, this connection comprises a substantially U-shaped rigid conductor 19 having one end or arm 20 threadingly engaging the walls of a centrally located opening in the shank end of the starting electrode and the other end 21 spot welded to the arms of the holder 17. The conductor is preferably of fernico wire. With this construction I have found that the electrode assembly has superior electrical and mechanical characteristics, and that the number of electrodes which become loose in the holders after prolonged operation is greatly decreased. Inasmuch as the conductor 19 is not normally called upon to carry the full current of the starting electrode, it may be of relatively small size so that the insertion of the end of the connector within the shank of the starting electrode does not become a source of trouble or require that a larger shank be employed.

While I have shown and described a particular embodiment of my invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from my invention in its broader aspects, and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electrode assembly for an electric discharge device comprising an elongated electrode having a resistance which is relatively high with respect to the remainder of the circuit in which it is connected, a first conductor for supporting and supplying current to said electrode including a portion encircling and tightly gripping one end of said electrode and provided with a portion for supporting said electrode from a lead-in conductor of the device and a second conductor having one end secured in an opening formed in said electrode and the other end secured to said first conductor.

2. A starting electrode assembly for an electric discharge device comprising an elongated starting electrode having a resistance which is relatively high with respect to the remainder of the circuit in which it is connected, a first conductor for supporting and supplying current to said electrode including a metal strap encircling one end of said electrode and provided with a portion for supporting said electrode from a lead-in conductor of the device, and a rigid conductor of substantially U shape having one end secured in an opening formed in said one end of the electrode and the other end secured to said first conductor.

3. An electrode assembly comprising an elongated electrode of carbonaceous material, a first conductor for supporting and supplying current to said electrode including a metallic conductor having a first portion surrounding said electrode near one end thereof and a second portion extending laterally from said electrode, and means for preventing arcing between said electrode and said conductor including a second conductor having one end connected to said second portion of said first conductor and the other end secured to said electrode in good electrical contact therewith.

4. An electrode assembly comprising an elongated electrode of carbonaceous material, a first conductor for supporting and supplying current to said electrode including a metallic conductor having a first portion surrounding said electrode near one end thereof and a second portion extending laterally from said electrode, and means for preventing arcing between said electrode and said conductor including a rigid conductor of substantially U shape having one arm connected to said second portion of said first conductor and the other arm secured in an opening formed in said one end of said electrode to form a good electrical connection between said U-shaped conductor and said electrode.

5. A starting electrode assembly for an electric discharge device of the type employing a liquid cathode comprising a starting electrode having a substantially cylindrical shank portion and a tip portion adapted to be immersed in the liquid of the cathode, a support and current supply conductor for said electrode including a metallic member surrounding the shank of said electrode, and a rigid conductor of substantially U shape having one end secured to said current supply conductor and the other end positioned in an axially extending opening formed in said shank and having good electrical contact therewith.

6. A starting electrode assembly for an electric discharge device of the type employing a liquid cathode comprising a starting electrode having a substantially cylindrical shank portion and a tip portion adapted to be immersed in the liquid of the cathode, a first conductor for supporting and supplying current to said electrode including a metal strap surrounding the shank of said electrode, and a rigid conductor of substantially U shape having one end secured to said first conductor and the other end positioned in and threadingly engaging the walls of an axially extending opening formed in said shank.

EDWIN W. SCOTT.