Feb. 26, 1935. C. B. LOS 1,992,493

DISCHARGE DEVICE

Filed Dec. 11, 1931

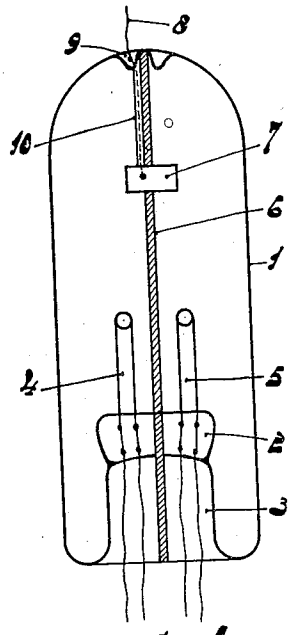

Fig. 1.

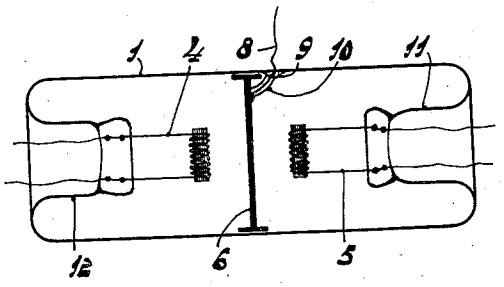

Fig. 2.

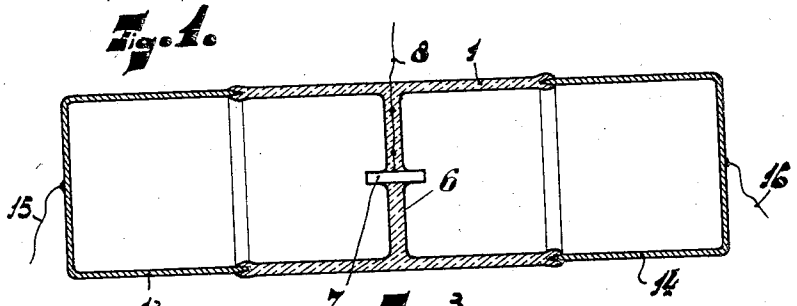

Fig. 3.

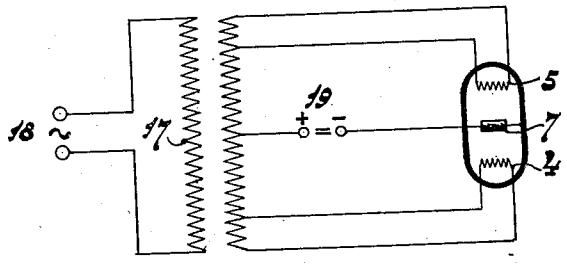

Fig. 4.

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DISCHARGE DEVICE

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5 Claims. (Cl. 250—27.5)

The invention relates to discharge tubes for full wave or polyphase rectification, more particularly to tubes comprising a single anode and two or more cathodes.

It is well-known to give the anode of such a rectifier the shape of a plate and to arrange it between the cathodes so that it also acts as a screen between these cathodes. As far as the production of a discharge between the incandescible cathodes is concerned, this construction is equivalent to that of polyphase rectifiers having arranged between a plurality of anodes a screen with an opening in which the incandescible cathode is arranged. As, in the latter case, for operating reasons, an opening has to be provided, there always exists the danger of a discharge being produced between the anodes.

Also in the previously known forms of execution of rectifiers comprising a plurality of incandescible cathodes, the danger existed of a discharge being produced between the incandescible cathodes. The danger thereof was increased by the fact that the two incandescible cathodes emit electrons and consequently a discharge may easily be produced between the said cathodes when one of them assumes the utmost negative and the other the utmost positive value.

According to the invention, use is made of the fact that if a polyphase rectifier comprises only a single anode, a screen can be arranged in such manner that the possibility of a discharge between the cathodes being established is entirely eliminated. The discharge tube according to the invention is characterized in that the cathodes are separated from one another by one or more screens. The anode preferably forms a unitary structure with the screen separating the cathodes. The anode may be arranged in this case in a glass wall which divides the discharge tube into as many chambers as there are cathodes. The screen itself may however also constitute the anode and if desired the screen may be provided in this case with special members towards which the discharge is directed.

The construction described is also particularly advantageous with a so-called glow-discharge rectifier in which the discharge is produced between cold electrodes. In this case an insulating partition is preferably provided in the middle portion of the glow-discharge rectifier, the anode being arranged in the partition whereas the two ends of the tube are provided with metal hoods which constitute the cathodes.

In order that the invention may be clearly understood and readily carried into effect it will be explained more fully with reference to the accompanying drawing which represents three diagrammatical embodiments of the invention and a diagram of connections. In said drawing:

Figure 1 represents a discharge tube in which the anode is arranged in the screen separating the cathodes.

Figure 2 represents a form of execution in which the screen itself constitutes the anode.

Figure 3 represents a glow-discharge rectifier to which the invention has been applied.

Figure 4 shows the circuit-arrangement of the rectifier described.

In Figure 1, incandescible cathodes 4 and 5 are arranged on the press 2 of the stem 3 of a discharge tube 1. In the middle between the incandescible cathodes is mounted a screen 6 of insulating or conductive material in which an anode 7, for example of graphite, is arranged. If the screen 6 consists of insulating material, the anode is provided with a separate supply wire 8 which in the form of execution shown is sealed-in at the top of the discharge tube at 9. If the screen consists of conductive material and if the anode is conductively connected thereto, a supply wire may be sealed-in at the top or at the bottom of the tube and simply be connected to the screen. Furthermore, the anode may also be arranged in a conductive screen so as to be insulated therefrom and in this case both the anode and the screen may be provided with a separate supply wire.

In the form of execution represented the screen must extend through the stem as far down as the lower end of the discharge tube so that a perfect screening between the cathode is ensured.

In order to prevent the supply wire 8 from being attacked by the discharge, this wire is provided with an insulating coating which consists in the form of execution represented of a ceramic substance 10 baked to the wire.

Figure 2 represents, by way of example, a form of execution in which the anode is constituted by a metal screen 6. In this figure corresponding parts are denoted by the same reference numerals as in Figure 1. The discharge tube has a symmetrical shape because there are two stems 11 and 12 each carrying an incandescible cathode.

Figure 3 represents a rectifier comprising cold electrodes. In this case the discharge tube consists of a glass tube 1 provided with a glass partition 6 having arranged in it an anode 7 with a very small surface. The open ends of the glass tube are closed by hoods 13 and 14, for example of ferrochromium, which have a large sur-

face so that they may act extremely well as cathodes. The hoods 13 and 14 are sealed on to the glass of the discharge tube 1 and provided with supply wires 15 and 16. On the inner side they may be provided with a coating adapted to emit electrons.

The discharge tube described may contain a gaseous filling consisting, for example, of the rare gases argon, helium, neon or crypton and having, if desired, added to it another gas such as mercury vapor. In the forms of execution shown in the Figures 1 and 2, a so-called Wehnelt cathode is utilized as the incandescible cathode. The screen between the cathodes preferably has a small aperture through which equalization of pressure between the various portions of the discharge tube may take place. In case the screen is made of metal, the screen as a rule does not form along its whole circumference a perfect joint with the glass wall of the tube, so that in this case no special opening is required for the equalization of the gas pressure between the chambers of the tube.

Figure 4 shows the circuit-arrangement of such a rectifier. The secondary winding of a transformer 17 which may be connected at 18 to the alternating current network, has a centre tap leading to one of the terminals 19 of a direct-current load the other terminal of which is connected to the anode 7 of the discharge tube. The incandescible cathodes 4 and 5 of the discharge tube are supplied from the secondary winding by means of tapped portions located near each end thereof. All the auxiliary devices such as resistances, switches, ammeters, etc. are omitted in this circuit-arrangement for the sake of clearness. During the one half-cycle the current flows through the upper part of the secondary winding, via the direct-current terminals 19 and the direct-current load to the anode 7 and thence via the incandescible cathode 5 back to the upper part of the secondary winding of the transformer 17. During the second half-cycle of the alternating current the current flows through the lower part of the secondary winding via the direct-current terminals 19, the anode 17, the incandescible cathode 4 and back to the lower end of the secondary winding. The two halves of the alternating-current cycle consequently pass in the same direction through the direct-current load connected at 19.

Although the forms of execution shown relate to rectifiers for full wave rectification of an alternating current, it is evident that with rectifiers for a three- or polyphase alternating current it is also possible, without departing from the principle underlying the present invention, to obtain a complete screening between the incandescible cathodes.

What I claim is:

1. A gaseous discharge device, comprising a vitreous envelope, both ends of which are closed by metal hoods sealed to the said envelope and forming the cathodes of the device, and a partition disposed centrally between said cathodes, said partition fully separating said cathodes, and an anode forming a unitary structure with said partition.

2. A full wave rectifier tube comprising an envelope, a partition wall in said envelope, disposed centrally and dividing said tube into two completely separated chambers, a cathode for each of said chambers and forming part of the envelope, and a common anode forming part of said partition wall, said anode being adapted to be connected through a load to the midpoint of a transformer winding to the two ends of which may be connected the cathodes.

3. A gaseous discharge tube, comprising an envelope divided into a plurality of chambers, a common partition structure completely separating said chambers, and a plurality of electrodes of one polarity, forming part of the wall of the envelope, one being provided for each of said chambers, and a common electrode of the other polarity forming part of said partition structure.

4. A full wave rectifier tube having an envelope, a gaseous filling therein, a central partition dividing said envelope into two hermetically separated chambers, a common electrode forming part of said partition and having an active surface in each of said chambers, and two complementary electrodes, one for each chamber, said complementary electrodes forming wall portions of said envelope.

5. A full wave rectifier tube having an envelope, a gaseous filling therein, a partition dividing said envelope into two chambers, an anode carried by said partition and having an active surface in each of said chambers, and a cold cathode for each of said chambers, said cathodes forming metallic wall portions of said envelope.

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