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RECTIFIERS FOR VOLTAGE DUPLICATING CIRCUITS

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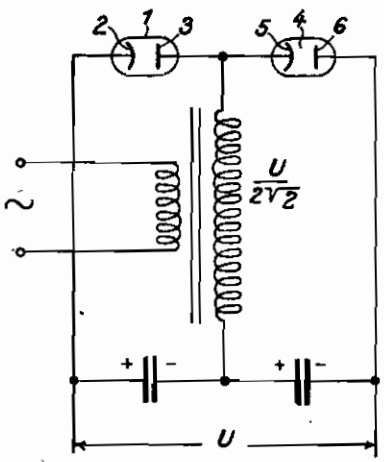

Fig. 1

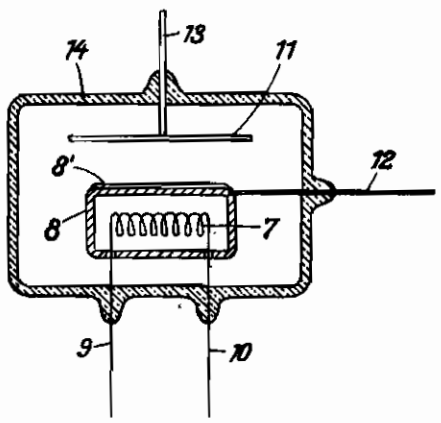

Fig. 2

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RECTIFIERS FOR VOLTAGE DUPLICATING CIRCUITS

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The present invention relates to rectifiers for voltage duplicating circuits and consists in certain features of novelty which will appear from the following description and be pointed out in the appended claims; reference being made to the accompanying drawing, in which

Fig. 1 shows the circuit diagram of a rectifier system known as the "Greinacher Circuit", while Fig. 2 is a longitudinal cross-section through one embodiment according to this invention.

Referring to Fig. 1 which shows a known rectifier system, reference numeral 1 indicates a first rectifier valve having a cathode 2 and an anode 3, while reference numeral 4 denotes a second rectifier valve including a cathode 5 and an anode 6. These two high tension valves or valve systems 1 and 4 are connected in series, that is, the anode 3 of the first valve system 1 is electrically connected with the cathode 5 of the second system 4. It has been proposed and readily realized to provide these two valve systems in one single discharge vessel common thereto. It has also been proposed in the past to combine the anode 3 and the cathode 5 in one unit, that is to say, in such manner that the anode 3 simultaneously serves as the supporting member for the electron emitting layer of the cathode 5. Such an arrangement which hereinafter will be defined as a "cathanode" is obviously advantageous since it does away with the otherwise necessary heating source which must be insulated against high tension voltages, but numerous technical difficulties have been encountered with respect to the design thereof. The essential reason for these difficulties resides in the fact that the anode surface facing the cathode is rendered active during operation, thereby causing electrons to flow in the blocking direction of the valve, that is, from the anode 3 to the cathode 2, with the result that the cathode is subject to destruction. Investigation carried out in the object to overcome this activation of the anode surface opposing the cathode have not yet led to the desired results.

It is an object of this invention to provide means which are capable of eliminating this undesired activation of the surface of the anode facing the cathode. This is realized according to the invention by the use of a cathode of thoriated tungsten or of tungsten which has been covered with a layer of thorium oxide. A cathode of the above mentioned kind operates at considerably higher temperatures than the cathodes heretofore employed for similar purposes, i. e. cathodes consisting of an oxide of a metal selected from the group of the alkaline earths.

The action of cathodes of thoriated tungsten or of cathodes of tungsten with a coating of thorium oxide will now be considered. During evaporation of the cathode activating substance, such as thorium, and the deposition of the thorium vapors on the anode, no substantial back-current is allowed to flow from the anode 3 to the cathode 2 since the suitable operating temperature of the cathanode is insufficient to cause an appreciable emission of thorium toward the cathode 2. The actual anode 3 must be so dimensioned that the cathanode by heat radiating from the cathode 2 assumes an operating temperature ranging between 750 and 800 degrees centigrade. During its formation, the thoriated tungsten or the thorium constituting the cathode must be heated to such a high temperature that the cathanode assumes a temperature at which the earths alkaline carbonates forming the coating of the cathanode are disintegrated into oxides.

It is an essential matter of design for the correct operation of this device that no vapor of barium may obtain access into the interior of the anode. The walls of the cathanode must be of such thickness that no diffusion of barium with the metal forming this member takes place. For example, if the cathode unit of the cathanode consists of nickel, the thickness of the walls must be in excess of .012 inch.

One embodiment of a device mentioned above is shown in Fig. 2, which shows a cathode 7 of thoriated tungsten in the shape of a helix. This cathode is surrounded by a cathanode 8 which is fully closed except the two narrow apertures 9 and 10 through which the leads of the cathode 7 project. This completly closed structure of the cathanode prevents vapors of earths alkaline metals from entering the interior of the cathanode. The coating of an earth alkaline oxide 8' is applied on the surface facing the anode 11 and consists preferably of a mixture of earth alkaline carbonates. The cathanode 8 has a lead-in conductor 12 and the serially connected further anode 11 is provided with a lead-in conductor 13. The discharge vessel enclosing the electrode system is shown at 14.

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