PATENT SPECIFICATION

Application Date: Oct. 18, 1937. No. 28331/37. **504,120**

Complete Specification Left: Aug. 11, 1938.

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PROVISIONAL SPECIFICATION

Improvements in Electrodes for High-pressure Mercury-vapour Discharge Devices

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British company, and VICTOR JAMES FRANCIS, of Research Laboratories, of The General Electric Company Limited, Wembley, Middlesex, a British subject, do hereby declare the nature of this invention to be as follows :—

This invention relates to electrodes of high-pressure mercury-vapour electric discharge (HPMV) devices of the type wherein a starting and a running electrode (in the sense of Patent Specification No. 472,658) are parts of the same mechanically integral body. Its object is to provide improved electrodes of this kind, the chief qualities sought being small size and simplicity of construction.

According to the invention an electrode of the type specified comprises (1) a rod of refractory metal (preferably tungsten), (2) a rod consisting of thermionically active material possibly supported by or mixed with metal, (3) a porous metal body uniting parts (1) and (2) end to end. The rods (1) and (2) are preferably of nearly the same diameter. The rod (2) may be composed of the known sintered mixture of alkaline earth compound ; but preferably it is a helix, or better still a plurality of helices one inside the other, of metal coated with or surrounding the active material. The porous metal body (3) is preferably a helix uncoated with thermionically active material, or at any rate with any such material which is as easily vapourisable as that forming part of the rod (2).

The part (1) is the running electrode and is turned towards the discharge ; the starting electrode is some part of the porous metal body (3) covering the rod (2). The whole electrode may be supported from behind, preferably by means of a prolongation of the wire constituting part (3).

It is to be understood that the relations between the parts of the electrode and of these parts to the remainder of the HPMV device are such that the conditions prescribed for starting and running electrodes in co-pending application No. 1594/37 (Serial No. 486,138) are fulfilled.

One embodiment of the invention is shown by way of example in the accompanying drawing. Here part (1) is a tungsten rod 4, 1.4 mm. in diameter and 6 mm. long ; part (2) is a rod of thermionically active material 0.8 mm. in diameter, supported by a helix 3 of tungsten wire, 0.3 mm. in diameter wound on a 0.8 mm. mandrel, the length of part (2) being 4 mms., part (3) is a helix 6 of tungsten wire 0.4 mm. in diameter close-wound on a mandrel 1.4 mm. in diameter. This helix covers the whole of the part (2) and extends 3 mm. along the part (1), thereby uniting these parts firmly. The electrode is supported in the discharge envelope by means of an extension of the helix 6.

Such an electrode is suitable for HPMV lamps consuming 250 watts with 160 volts between running electrodes 35 mm. apart.

Dated the 18th day of October, 1937.
For the Applicants,
NORMAN R. CAMPBELL.

COMPLETE SPECIFICATION

Improvements in Electrodes for High-pressure Mercury-vapour Discharge Devices

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British company, and VICTOR JAMES FRANCIS, of Research Laboratories, of The General Electric Company Limited, Wembley, Middlesex, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to high-pressure metal-vapour electric discharge (H.P.M.V.) devices of the type comprising an electrode

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structure wherein a starting and a running electrode (in the sense of Patent Specification No. 472,658) are parts of the same mechanically integral body. Its object is to provide improved electrode structures of this kind, the chief qualities sought being small size and simplicity of construction.

It is pointed out in Patent Specification No. 486,138 that, with some kinds of starting and running electrodes, it is possible to find conditions in which the discharge transfers itself partially, but not wholly, during the run up; the starting electrode continues to act as the cathode during one half of the cycle, but the associated running electrode acts as the anode during the other half. Electrodes in which such partial transference takes place are not within the scope of this invention.

According to the invention in an H.P.M.V. device of the type specified, the said electrode structure comprises (1) a rod of refractory conducting material (preferably tungsten or thoria mixed with tungsten powder), (2) an elongated body consisting wholly or partly of thermionically active material more easily vaporizable than the said refractory metal, (3) a porous metal body uniting parts (1) and (2) end to end. The rods (1) and (2) are preferably of nearly the same diameter. The rod (2) may be composed of the known sintered mixture of alkaline earth compound; but it may also be a helix, or a plurality of helices one inside the other, of refractory metal coated with or surrounding the active material. The porous metal body (3) is preferably a refractory metal helix; in order that it shall be distinguishable from a helix forming part of the rod (2), it must not be provided with a store of thermionically active material which is as easily vaporizable as that forming part or the whole of the rod (2), so that the body (2) is unnecessary.

The part (1) is the running electrode and is turned towards the discharge; the starting electrode is some part of the porous metal body (3) covering the body (2) or possibly the body (2) itself. The whole electrode may be supported from behind, preferably by means of a prolongation of the wire constituting part (3).

One embodiment of the invention is shown by way of example in the drawing accompanying the provisional specification. Here part (1) is a tungsten rod 4, 1.4 mm. in diameter and 6 mm. long, the outer end being coated with a sintered mixture of thoria and tungsten powder; part (2) is a rod 2 of thermionically active material 0.8 mm. in diameter, supported by a helix 3 of tungsten wire, 0.3 mm. in diameter wound on a 0.8 mm. mandrel, the over-all length of part (2) being 4 mm.; part (3) is a helix 6 of tungsten wire .4 mm. in diameter, close-wound on a mandrel 1.4 mm. in diameter. This helix covers the whole of the part (2) and extends 3 mm. along the part (1), thereby uniting these parts firmly. The electrode structure is supported in the discharge envelope by means of an extension of the helix 6.

Such an electrode structure is suitable for HPMV lamps consuming 250 watts with 160 volts between running electrodes 35 mm. apart.

In view of Claim 4 of Patent Specification No. 491,176, not published at the date of this application, which Claim refers to Figure 2 of the drawing accompanying the said specification, we declare that we exclude from the scope of our claims a device, otherwise according to Claim 1 of this specification, in which the element (1) is a tungsten rod 1 mm. in diameter and 5 mm. long coated with thoria on the part of its surface not covered by the element (3), this part being 2 mm. long, in which the element (2) is a helix, 7 mm. long, of 0.2 m.m. tungsten wire wound on a 0.6 mm. mandrel, enclosing a rod of alkaline earth silicate, and in which the element (3) is an inner helix, 7 mm. long, wound of 0.4 mm. tungsten wire on a 1 mm. mandrel, surrounded by an outer helix wound of 0.4 mm. tungsten wire on a 1.75 mm. mandrel, which outer helix extends from the back of the said inner helix about half way along the said tungsten rod, the pitches of all the said helices being between 100% and 120% and the back end of the said outer helix being welded to the leading-in-wire.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim, subject to the foregoing disclaimer, is:—

1. A high-pressure metal-vapour electric discharge device of the type specified wherein the said electrode structure comprises (1) a rod of refractory conducting material and (2) an elongated body consisting wholly or partly of thermionically active material more easily vaporizable than the said refractory metal and (3) a porous metal body uniting parts (1) and (2) end to end.

2. A device according to Claim 1 wherein the said porous body is a refractory metal helix.

3. A device according to Claim 1 or 2 wherein the said body (2) is a helix, or a plurality of helices one within the other, coated with or surrounding the active material.

4. A high-pressure metal-vapour elec-

structure wherein a starting and a running electrode (in the sense of Patent Specification No. 472,658) are parts of the same mechanically integral body. Its object is to provide improved electrode structures of this kind, the chief qualities sought being small size and simplicity of construction.

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The part (1) is the running electrode and is turned towards the discharge; the starting electrode is some part of the porous metal body (3) covering the body (2) or possibly the body (2) itself. The whole electrode may be supported from behind, preferably by means of a prolongation of the wire constituting part (3).

One embodiment of the invention is shown by way of example in the drawing accompanying the provisional specification. Here part (1) is a tungsten rod 4, 1.4 mm. in diameter and 6 mm. long, the outer end being coated with a sintered mixture of thoria and tungsten powder; part (2) is a rod 2 of thermionically active material 0.8 mm. in diameter, supported by a helix 3 of tungsten wire, 0.3 mm. in diameter wound on a 0.8 mm. mandrel, the over-all length of part (2) being 4 mm.; part (3) is a helix 6 of tungsten wire .4 mm. in diameter, close-wound on a mandrel 1.4 mm. in diameter. This helix covers the whole of the part (2) and extends 3 mm. along the part (1), thereby uniting these parts firmly. The electrode structure is supported in the discharge envelope by means of an extension of the helix 6.

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2. A device according to Claim 1 wherein the said porous body is a refractory metal helix.

3. A device according to Claim 1 or 2 wherein the said body (2) is a helix, or a plurality of helices one within the other, coated with or surrounding the active material.

4. A high-pressure metal-vapour elec-

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tric discharge device of the type specified wherein the said electrode structure is constructed substantially as described with reference to the drawing accompanying the provisional specification.

Dated the 11th day of August, 1938.

For the Applicants,
NORMAN R. CAMPBELL.

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