Jan. 20, 1959 H. J. M. VAN TOL 2,870,366

ELECTRIC DISCHARGE TUBE OF THE KIND COMPRISING A CATHODE OF THE INDIRECTLY HEATED TYPE

Filed Oct. 1, 1952

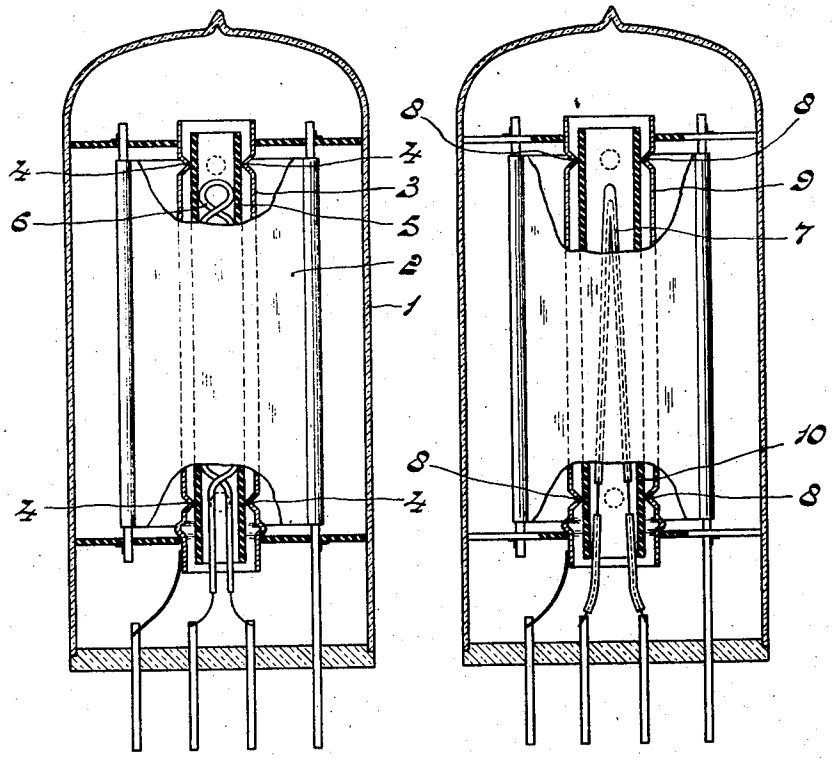

Fig. 1 Fig. 2

INVENTOR

HENDRIKUS JOHANNES MARIE VAN TOL

BY

AGENT

United States Patent Office

2,870,366

Patented Jan. 20, 1959

2,870,366

ELECTRIC DISCHARGE TUBE OF THE KIND COMPRISING A CATHODE OF THE INDIRECTLY HEATED TYPE

Hendrikus Johannes Marie van Tol, Eindhoven, Netherlands, assignor, by mesne assignments, to North American Philips Company, Inc., New York, N. Y., a corporation of Delaware

Application October 1, 1952, Serial No. 312,592

Claims priority, application Netherlands October 13, 1951

2 Claims. (Cl. 313—337)

The invention relates to electric discharge tubes comprising an electrode system having an indirectly heated cathode, and in particular to those tubes suitable for use in circuit-arrangements in which a high potential is applied between an activated cathode sleeve and a heating filament.

Television circuit-arrangements often require that a high voltage difference of, for example, about 5000 v. exists between the filament and the cathode of tubes employing indirectly heated cathodes.

The main object of the invention is to provide an indirectly heated cathode with improved insulation between the filament and the activated cathode sleeve.

According to the invention, an extremely satisfactory insulation between the cathode sleeve and the filament wire may be obtained in an electric discharge tube comprising an electrode system having a cathode of the indirectly heated type by housing the filament body in an insulating cylinder which is supported by the cathode sleeve at given areas by re-entrant portions of the cathode sleeve, these portions holding the insulating cylinder spaced apart from the cathode sleeve, and at the given areas the filament body is spaced from the inner side of the insulating cylinder. The term filament body when used herein is to be understood to mean a filament wire coated or not coated with insulating material.

In a preferred arrangement, the insulating cylinder is clamped tight by three points pressed in the cathode sleeve at opposite ends of the cathode so that the cylinder is not in contact with the cathode sleeve at any other points.

In accordance with the invention, the filament wire is arranged so that it does not engage the inner side of the cylinder at the areas where the re-entrant parts of the cathode sleeve are in contact with the outer side of the insulating cylinder. This may be effected at the upper end of the cathode by providing a slightly shorter length of the filament body, and, in the case of a helical filament wire, at the lower end by causing the ends of the filament wire to extend straight beyond the cathode, or, in the case of an insulated filament wire consisting of straight portions, by removing the insulation of this wire at the level of the re-entrant parts over a certain length so that the uncovered wire is then spaced from the inner surface of the insulating cylinder.

The invention will now be described with reference to the accompanying drawing in which:

Fig. 1 shows a discharge tube comprising an indirectly heated cathode according to the invention;

Fig. 2 shows a modification of the tube shown in Fig. 1.

Referring to Fig. 1, which shows a tube according to the invention, a bulb 1 encloses an electrode system comprising an anode 2 and an indirectly heated cathode assembly. The cathode comprises a metal sleeve 3 coated with an electron emissive material and having a plurality of re-entrant parts 4 at each end. These re-entrant parts 4 support an insulating cylinder 5 spaced apart by a certain distance from the cathode sleeve 3.

An insulated filament helix 6 is arranged inside the cylinder 5 such that it does not engage the insulating cylinder 5 at the level of the re-entrant parts 4. At the top, the end of the helix 6 lies below the upper re-entrant parts 4. At the bottom end, the filament wire is straightened so that its ends emerge from the cathode free from the insulating tube 5. It is clear that the insulated path between the activated cathode sleeve 3 and the filament wire 6 is, in accordance with the invention, materially longer than in the case where the cathode sleeve and the filament wire engage the cylinder 5 on the outer and on the inner side at opposite points. Moreover, in the proximity of the points of contact of the cathode sleeve, the parts of the insulating cylinder 5 remain cooler, so that at this area the insulation of the cylinder is also better maintained.

Fig. 2 shows a similar tube to that shown in Fig. 1 comprising, however, a V-shaped filament body 7, the top of which lies below upper re-entrant parts 8 of a cathode sleeve 9. The limbs of the filament body 7 are freed from insulating material along a certain length at the level of the lower re-entrant parts 8, and, therefore, are clear from the inner wall of an insulating cylinder 10. With a construction according to the invention, reliable operation of the tube in television circuit-arrangements, in which voltage differences of 6000 v. may occur between the filament wire and the cathode sleeve, is assured.

In the embodiments described above, the diameter of the cathode is 3.0 mms. and the spacing between the insulating cylinder and the cathode sleeve is 0.1 to 0.2 mm. The wall thickness of the insulating cylinder is 0.38 mm. and the insulating material thereof is made of magnesia. However, as an alternative, another insulating material, for example quartz or ceramic material may be used.

While I have thus described my invention with specific examples and embodiments thereof, other modifications will be readily apparent to those skilled in the art without departing from the spirit and the scope of the invention as defined in the appended claims.

What I claim is:

1. An electric discharge device comprising an indirectly heated cathode assembly capable of withstanding high voltages, said cathode assembly comprising a heating filament, an electrically insulating cylinder enclosing and supporting said filament at at least one point, and an activated cathode sleeve enclosing said cylinder and substantially spaced therefrom, said cathode sleeve having re-entrant portions in engagement with said cylinder only at points at which the filament is spaced from said cylinder for supporting said cathode sleeve.

2. An electric discharge device comprising an indirectly heated cathode assembly capable of withstanding high voltages, said cathode assembly comprising an electrically insulated heating filament, an electrically insulating cylinder enclosing and supporting said filament at a plurality of points, and an activated cathode sleeve enclosing said cylinder and substantially spaced therefrom, said cathode sleeve having re-entrant portions in engagement with said cylinder only at a few given points at which the filament is spaced from said cylinder for supporting said cathode sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

1,870,968	Sinden	Aug. 9, 1932
1,974,448	Crowley	Sept. 25, 1934
1,982,885	Stupakoff	Dec. 4, 1934
2,079,057	Weeks	May 4, 1937
2,081,415	Veazie	May 25, 1937