

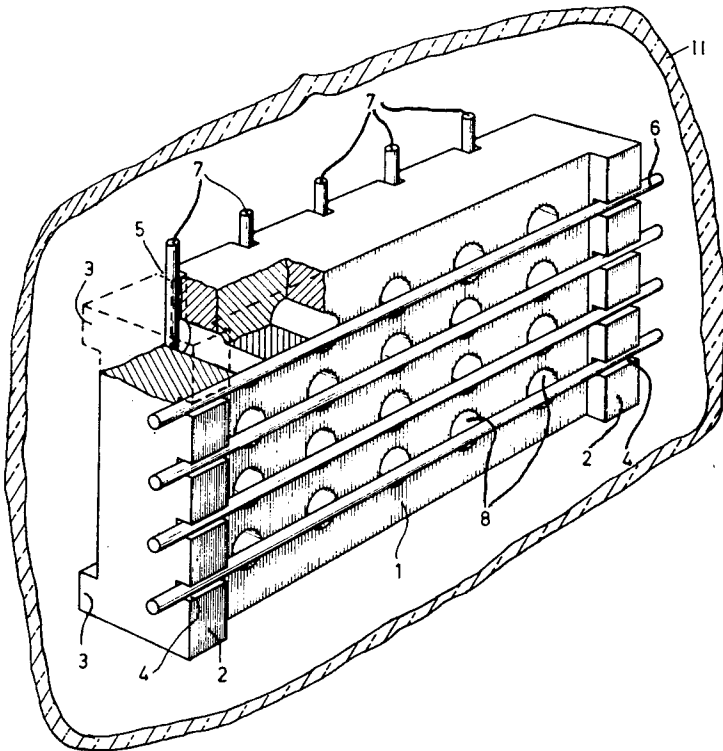
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[33] **Netherlands**
[31] **6807093**

[51] Int. Cl. **H01j 61/66**
[50] Field of Search..... **313/109.5,**
220, 218; 315/169, 169 TV

[56] **References Cited**
UNITED STATES PATENTS
3,499,167 3/1970 Baker et al..... 313/220 X
3,334,269 8/1967 L'Heureux 315/169 X
Primary Examiner—Raymond F. Hossfeld
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[54] **GAS DISCHARGE TUBE HAVING TWO SYSTEMS**
OF INTERSECTING ELECTRODES
1 Claim, 2 Drawing Figs.
[52] U.S. Cl..... **313/109.5,**
313/218, 315/169 R

ABSTRACT: In a gas discharge tube having two intersecting systems of electrodes the anode wire is provided with a resistance layer. As a result of this more discharges can cooperate with one and the same anode. Therefore, it is possible to supply a pattern of discharges which nearly burn until an extinguishing signal is given. The memory is now built in the tube.



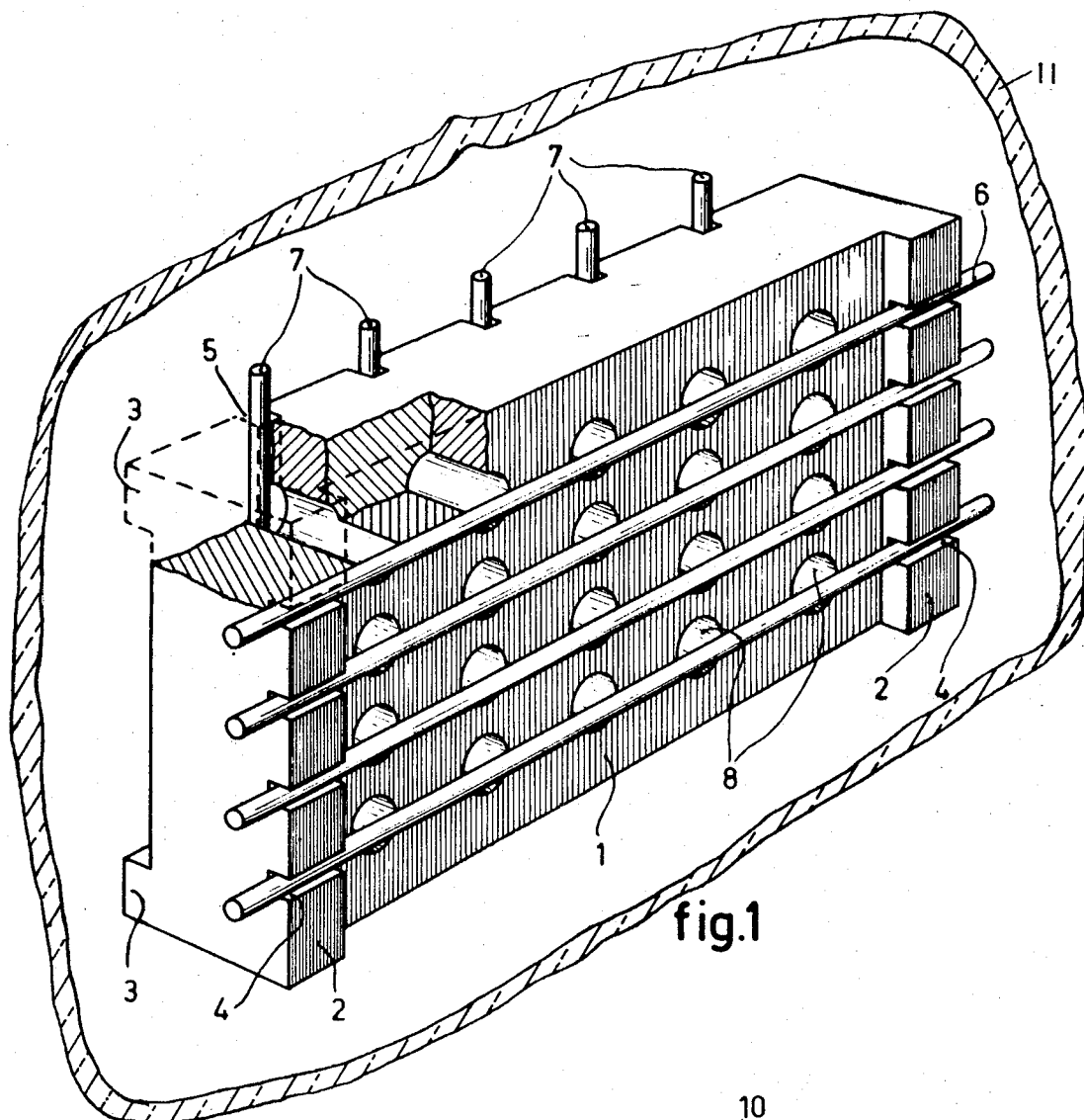


fig.1

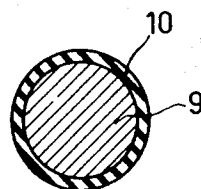


fig.2

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GAS DISCHARGE TUBE HAVING TWO SYSTEMS OF INTERSECTING ELECTRODES

The invention relates to a gas discharge tube having two systems of elongate electrodes situated in parallel planes, the electrodes of one system intersecting those of the other system at right angles. These electrodes are to be understood to include both parallel wires in each system and concentric circles in one system and radial electrodes in the other system.

In the known discharge tubes no or one single discharge can take place at a given instant near an intersection of the electrodes, or several discharges can take place simultaneously. In this latter case, however, these discharges will always be associated with intersections of various electrodes of one of the systems of electrodes, with one single electrode of the other system.

This means that in displaying a variable pattern of light-emitting discharges at the intersections, the memory actions do not last longer than the sensing of the intersections of one of the electrodes. In connection with the fact that the current intensity is restricted so as to avoid too strong a sputtering of the electrodes, this means that the luminous efficiency is comparatively low. It is the object of the invention to minimize the above-mentioned drawbacks.

According to the invention, in a gas discharge tube having two systems of elongate electrodes situated in parallel planes, the electrodes of one system intersecting those of the other system at right angles, the electrodes which serve as anodes which constitute one system, are covered with a resistance layer.

By providing the resistance layer according to the invention it is achieved that the electrode serving as an anode has a voltage across all the associated intersections which is independent of the number of discharges occurring at said intersections, provided the internal resistance of the voltage source is sufficiently low. It is consequently possible to ignite new discharges by supplying oppositely directed pulses to the cathode and the anode of an intersection to be ignited. In a similar manner the discharge at a given intersection can be extinguished by extinguishing pulses. For displaying given information it need consequently be applied only once to a given intersection independent of the time during which the information must remain visible. It is therefore not necessary to sense continuously when the picture is stationary.

The bias voltage between the anode and the cathode will generally have to be higher than that at which the discharge extinguishes spontaneously at an intersection, but lower than the ignition voltage. The sum of the ignition pulses which usually are equally large at the anode and the cathode must bridge the difference between the bias voltage and the ignition voltage, and likewise the sum of the extinguishing pulses must bridge the difference between the bias voltage and the extinguishing voltage. This condition may not be met with one single pulse. Dependent upon the thickness of the resistance layer on the anode, and upon the possible lateral boundary of

the discharge paths at the intersections, the resistivity of the layer according to the invention may be between 10^3 and 10^8 ohm cm.

The layer chosen may not show ion conductivity lifetime. In this connection, certain phosphorus vanadate glasses are particularly suitable. The thickness will be between 5 and 100 μ .

The invention will now be described with reference to the accompanying drawing, in which FIG. 1 shows a simplified form of the electrode system for a gas discharge tube according to the invention, while FIG. 2 is a cross-sectional view through an electrode.

Referring now to FIG. 1, reference numeral 1 denotes an anodized aluminum plate having vertical flanges 2 and horizontal flanges 3 on the front and rear side, respectively. The flanges comprise grooves 4 and 5, respectively. Electrodes 6 and 7, respectively, are situated in the grooves. The connection of the wires is not shown. Opposite to the intersections of the wires 6 and 7, the aluminum plate comprises holes 8 which are likewise anodized. The anode wires consist of a metal core 9 surrounded by a layer of phosphorus vanadate glass 10, thickness 50 μ (see FIG. 2). The glass has the composition:

25	V_2O_5	30-80% by weight.
	P_2O_5	5-22% by weight.
	Sb_2O_3	0-20% by weight.
	As_2O_3	0-6% by weight.
	PbO	0-14% by weight.
	BaO	0-2% by weight.
30	CaO	0-2% by weight.
	Bi_2O_3	0-25% by weight.
	in which in addition	
	in which in addition	
	$V_2O_5+P_2O_5$	45-95% by weight.
35	$As_2O_3+Sb_2O_3$	1.5-22% by weight.
	$P_2O_5+Bi_2O_3+As_2O_3+Sb_2O_3$	18-35% by weight.

This glass has a resistivity of 10^3 to 10^8 ohm-cm. and shows no ion conductivity.

For simplicity, further details of the tube are not shown in the drawing and only one plate of 4x5 holes is shown.

I claim:

1. An electric discharge device comprising an envelope, two systems of elongate electrodes situated in parallel-spaced planes within said envelope, the electrodes of one system intersecting those of the other system at right angles, an ionizable gaseous medium between the two systems of electrodes, the electrodes of one of said electrode systems constituting cathodes and the electrodes of the other of said systems constituting anodes for said device, the electrodes constituting anodes being wires each comprising a metal core covered with a layer of phosphorus vanadate glass having a thickness of from 5 to 100 μ and a resistivity between 10^3 and 10^8 ohm cm.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,612,938 Dated October 12, 1971

Inventor(s) T.J. De Boer; J.H.M. Johanns; Z. Van Gelder; H.J.L. Traj

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, Line 4, after "conductivity" insert --, i.e.

become conductive as a result of

being ionized during its--

Column 2, Line 14, after "respectively" insert --, mounted

within an envelope 11--.

Signed and sealed this 25th day of April 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents