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TELEPHONE SWITCH UTILIZING A MULTIELECTRODE GASEOUS DISCHARGE TUBE

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Fig. 1.

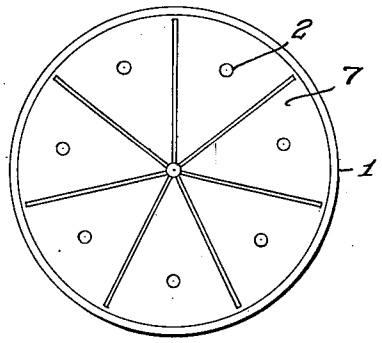


Fig. 2.

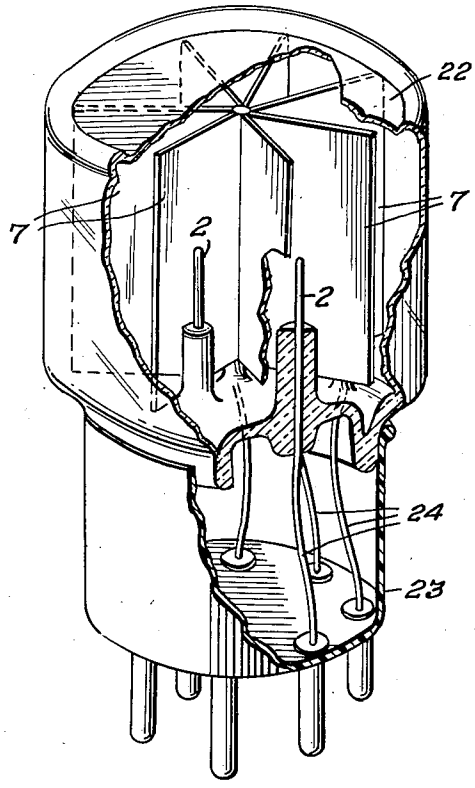
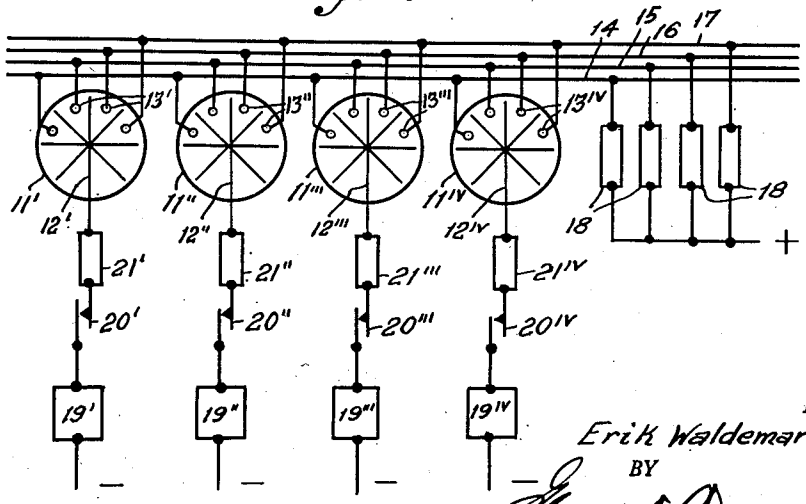


Fig. 3.



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TELEPHONE SWITCH UTILIZING A MULTI-ELECTRODE GASEOUS DISCHARGE TUBE

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1 Claim. (Cl. 179—18)

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The present invention relates to a connecting device containing gaseous discharge tubes having a plurality of electrodes, and is particularly intended for line finding purposes in automatic telephone plants or the like.

The electron tube in a device according to the invention consists of a gaseous discharge tube having a plurality of electrodes which are so arranged that a plurality of separate discharge chambers are obtained within the tube, which chambers are separated from each other in such a way that a discharge in one chamber does not substantially influence the electric properties of other discharge chambers.

The electron tube is provided with an electrode common to several or all of the discharge paths in the tube which paths are shielded from each other and from the surroundings. In this case the common electrode is suitably so formed that it simultaneously will serve as a shield between the different discharge paths, for instance a honeycomb like arrangement, in the hollow spaces of which the other electrodes are placed. The common electrode may suitably be further closed by means of an insulating disc on that side where the connections to the other electrodes are inserted and by another insulating disc or a metal disc on the opposite side.

The inlet openings of the insulating disc are desirably made so large that leakage from the disc surface to the lead-in wires is prevented.

In most cases the tubes will be constructed for connection in the usual manner to a tube socket. It may then be suitable to form those electrodes which are intended to be anodes—provided that the anode does not constitute the shielding electrode—in such a way that they will pass through the tube envelope and at the same time form base pins. Electrodes, which are intended to be used as cathodes, may under the same conditions suitably consist of small plates attached to the base pins inside the tube envelope.

In the appended drawings, Figure 1 shows schematically a tube for use in a device according to the invention,

Figure 2 is a perspective view of the tube, and

Figure 3 indicates schematically a connecting device utilizing tubes according to the invention.

In Figs. 1 and 2 the envelope of the electron tube is indicated by 1, the electrodes in each of seven discharge paths by 2 and the partition walls between the different discharge paths by 7. The electrodes can be arranged so that they can be brought out directly through the envelope (perpendicularly to the plane of the drawing in Fig. 1), and at the same time serve as base pins for connection with lead-in wires 24 of a common tube socket 23 having eight contacts.

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The tube has an electrode 7 common to all discharge paths. The common electrode is arranged so that it shields the other electrodes from one another, separate discharge spaces thereby being obtained between the common electrode and each individual one of the remaining electrodes. For further shielding of the discharge paths, mica plates 22 are arranged at one or both ends of the common electrode 7.

In the drawing, the common electrode is formed of radially placed plates 7, which divide the tube into seven different discharge spaces, each containing one of the other electrodes.

In Fig. 3 a connecting device according to the invention is shown schematically, for instance a line finder, in which tubes of the kind described above are used. Four tubes are indicated 11'—11^{IV} in the drawing, each provided with a cathode (or anode) 12'—12^{IV} and four anodes (or cathodes) 13'—13^{IV}.

Each of the four anodes in each tube is connected to one of four conductors 14, 15, 16, 17 each connected with an impedance 18. Each cathode 12'—12^{IV} is connectable to an electrical device 19'—19^{IV} of an arbitrary kind over a contact 20'—20^{IV} and over an impedance 21'—21^{IV}, which device is desired to be connected to any one of the conductors 14, 15, 16, 17, when the contacts 20', 20'', 20''' and 20^{IV}, respectively, of the device is closed, yet so, that a communication cannot be obtained with a conductor connected with another device 19. The devices 19' to 19^{IV} and the contacts 20' to 20^{IV} are not shown in detail since their structure forms no part of the present invention. They may form part of a telephone switching system of known kind in which devices 19' to 19^{IV} are selection stages and contacts 20' to 20^{IV} are controlled to establish a selected communication channel. Such a connection is procured by the tubes 11 in the following manner: on closing (for instance) the contact 20', a voltage is obtained over the cathode-anode paths in the tube 11' corresponding to the full voltage between the terminals of a current source (+ and — in the figure). This voltage is higher than the ignition voltage of the tubes. Due to this a discharge starts between the electrode 12' and an arbitrary electrode 13'. At the same time, however, by a suitable choice of voltage and impedances 21 the voltage across the tube between the electrode 12' and the remaining electrodes 13' (due to the voltage drop in the impedance

21') becomes so low that further paths cannot be ignited. In the figure the discharge obtained is indicated by a full arrow in the tube 11'. The device 19' is then connected over the discharge path to the wire 15, which due to the voltage drop in the impedance 18, acquires a lower potential than the wires 14, 16 and 17. If now (for instance) the contact 21''' is closed, the full voltage of the current source will be obtained between the electrode 12''' and those electrodes 13''' which are not connected to wire 15. A discharge of the tube may therefore only take place over some of these "idle" electrodes, and thus the device 19''' is connected with a free wire. Otherwise the process becomes the same as before. If a discharge thereafter occurs for example in the electrode path marked with a dotted arrow, the device 19''' is connected to the wire 16 and only the wires 14 and 17 are thereafter free for connection to a further device 19.

The invention is of course not limited to connections according to Fig. 3, and the tubes present quite especial advantages for all kinds of line finders and the like due to the fact that complicated mechanical constructions are replaced by tubes having no movable parts whatever.

I claim:

In a connecting device for automatic telephone plants or the like of the type which includes a plurality of gaseous discharge tubes for effecting connections between certain incoming lines to certain outgoing lines, each of said discharge tubes having an impedance connected in series therewith and with an incoming line and a second impedance in series with each of said outgoing lines, the improvement which comprises constituting each of said discharge tubes by a common envelope containing a common gas atmosphere a plurality of electrodes and a single counter-electrode common to all said electrodes, wherein said counter-electrode is arranged to shield said other electrodes from each other and disposed so as to divide the gas atmosphere within said envelope into a number of different discharge chambers each containing one of said electrodes so as to prevent the discharge in one of said chambers from influencing the electric properties of the other discharge chambers, a number of incoming lines each connectable to the counter-electrode of one of said tubes, a

number of outgoing lines connected to one of said other electrodes in each of said tubes, an impedance in series between each counter-electrode and each incoming line, a second impedance in series with each of said outgoing lines, a contact for connecting each incoming line to the corresponding counter-electrode, and a current source one pole of which is connected with each incoming line and the other pole of which is connected with said second impedances, the voltage of said current source being such as to produce ignition between said counter-electrodes and one of said other electrodes immediately upon closing of the contact in series with the counter-electrode in question, whereby the corresponding incoming line is connected to the outgoing line belonging to said other electrode over a path including said contact, said first impedance and the discharge between said counter-electrode and said other electrode in question; the voltage drop in said first impedance preventing the ignition of the other discharge paths between said counter-electrode and the other electrodes in said tube, and the voltage drop in the second impedance connected to the outgoing line in question reducing the potential of this line in such a way that the potential of all electrodes in other tubes connected with the same outgoing line is insufficient for producing ignition between these electrodes and the counter-electrode on connecting another incoming line to its corresponding tube, while the ignition of such tube takes place between its counter-electrode and another of its electrodes which is connected with an outgoing line not occupied at the same instant.

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