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W. DÄLLENBACH
SHORT WAVE DISCHARGE TUBE
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Fig. 1

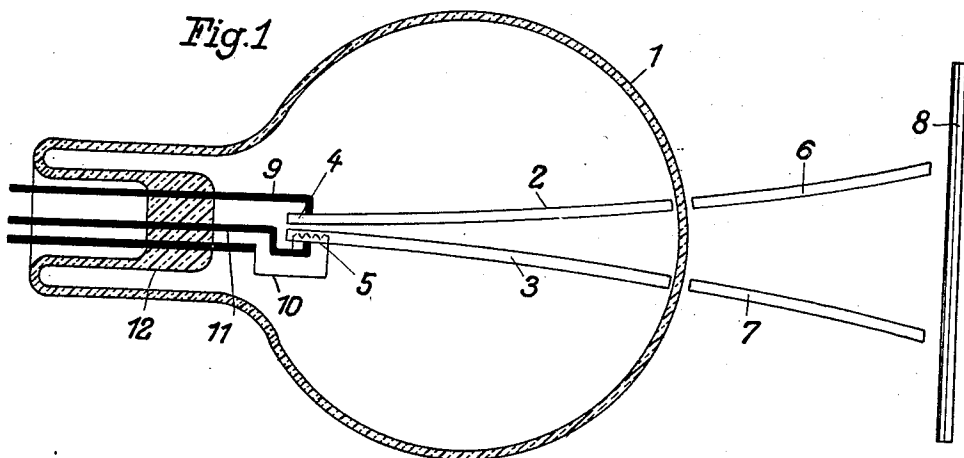


Fig. 2

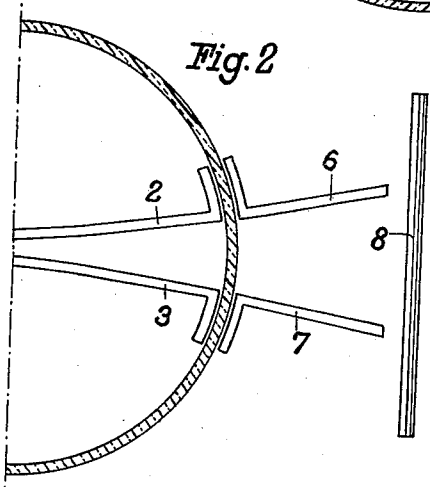


Fig. 3

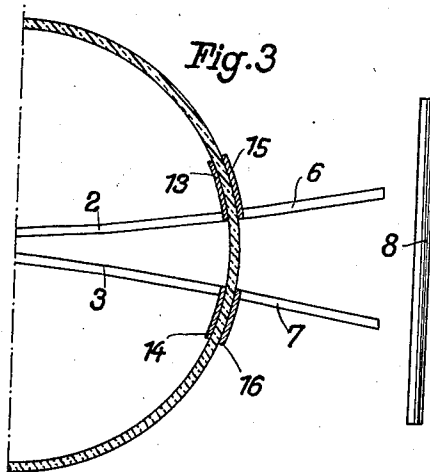
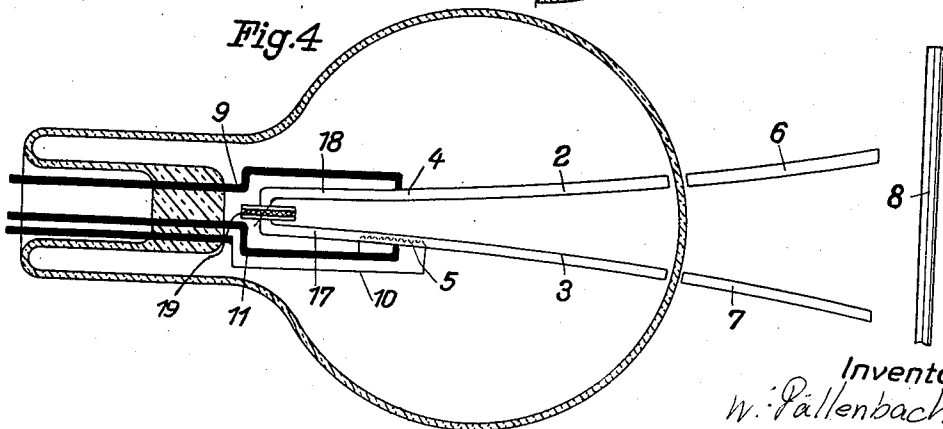


Fig. 4



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SHORT WAVE DISCHARGE TUBE

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8 Claims. (Cl. 250—27.5)

This invention relates generally to short wave discharge tubes for receiving or emitting high frequency energy and specifically to such tubes in combination with separate leads outside of the wall of the tube.

It is known to pass a conductor for high frequency energy from the inside of a vacuum vessel through the glass wall and to the outside, but in such case a fusion is necessary and this causes variations in the wave resistance and a consequent irregularity in the formation of the oscillations.

The object of the present invention is to provide a conductor for high frequency energy, which extends partly inside and partly outside a vacuum vessel and whose inside and outside portions are guided close to the insulating wall of the vessel without, however, passing through it so that the energy is transmitted from one portion to the other merely owing to coupling by the electromagnetic and electrostatic field.

By way of example, the invention is diagrammatically illustrated in the accompanying drawing, in which

Figure 1 shows a simple constructional example.

Figure 2 shows another constructional example in which condenser plates are formed by the conductor ends at both sides of the vessel wall.

Figure 3 shows a constructional example in which the wall is metallized on both sides.

Figure 4 shows a constructional example in which the energy conducting line is extended on the side of the electrodes and bridged over with a condenser.

Referring to the drawing, and first to Fig. 1, the latter shows a tube for producing, amplifying or receiving high frequency energy and discloses all essential features of the invention. 1 is a vacuum vessel of glass or quartz, 2 and 3 are two conductors of an energy conducting line for conducting the high frequency energy produced at the electrodes, namely, the anode 4 and the cathode 5, in the direction of the wall. The conductors 2 and 3 terminate near the wall. Outside the vacuum vessel the extension members 6 and 7 forming a continuation of the conductors 2 and 3 are provided and may be coupled, for example, with an electric aerial 8 which gives off the energy arriving by the conductor in the form of radiation. The faces of the conductor portions 2, 3 and 6, 7 are arranged relative to one another on both sides of the glass wall like the armatures of two condensers. The glass wall crosses the field space of these condensers. As in this

case the conductors 2 and 3 are electrically connected with the anode 4 and the cathode 5 of the electron current system causing the oscillations, it is necessary to provide these conductor portions 2 and 3 with certain potentials so as to start the mechanism for producing oscillations. For this purpose, lead-in wires 9 for the anode and lead-in wires 10 and 11 for the cathode and the heating thereof are connected outside the field space located between the conductor portions 2 and 3, i. e., preferably away from this field space in the shadow of the electromagnetic field between the portions 2 and 3, and may be introduced for instance through a press 12.

Such an introduction of current through a press served hitherto for supplying the electrode potentials as well as for conducting the high frequency energy generated or to be amplified or to be received. According to the invention, these two functions are carried out by different parts of the tube, as indicated above, and the electrode potentials are brought inside the tube in a way differing from that for supplying or discharging the high frequency energy.

Compared with apparatus in which the conductor portions 6 and 7 as well as the coupled electric aerial 8 are inside the vacuum vessel also, a construction according to Fig. 1 permits the convenient adjustment of the entire oscillation structure to the frequency to be produced, amplified or received. This can be done by varying the length of the conductor portions 6, 7 which are outside the vacuum or by tuning the electric aerial 8. In many instances it will be advisable to vary both elements of the connection. As a rule, both the length of the conductor portions 6, 7 and of the aerial 8 as well as the coupling of the aerial 8 to the conductor portions 6, 7 will be adjustable.

In the construction shown in Fig. 2 the ends of the conductor portions 2, 3 and 6, 7 near the glass wall are broadened for the purpose of rendering the coupling capacity transversely to the wall of the conductor portions disposed outside and inside the vacuum vessel as great as possible. This coupling capacity is further enhanced by silvering the glass wall either inside or outside or both inside and outside, as shown in Fig. 3. 13 and 14 designate the silver coatings inside the vacuum vessel, which are electrically connected with the conductor portions 2 and 3. 15 and 16 designate the silver coatings disposed outside the vacuum vessel, opposite the coatings 13 and 14, on the glass or quartz surface, which are elec-

trically connected to the conductor portions 6 and 7.

It is not necessary to conduct the energy by means of an ordinary Lecher system with parallel conductors. The latter may have also a form deviating from a parallel wire system, as shown in Figs. 1 to 3. For example, the energy may be conducted by two bands which, as indicated in Fig. 1, vary their relative distance in such a way that it is very small at the point of the electrode system 4, 5 and much larger at the point where the electric aerial 8 is coupled to the line of energy. If the line is to have constant impedance over its entire length, the width of the bands must be increased in proportion to their increase in distance.

To keep the high frequency energy leaking off in Fig. 1 over the conductors 9, 10, 11 as small as possible, it is advisable to continue during arrangement of the electrodes 4, 5 the line in a potential loop of the line portions 2, 3 on the side of the electrode for an odd multiple of one-fourth of the wave length so that the line of energy terminates near the press bridged by a short-circuit capacity with a current loop.

This is shown in Fig. 4. The conductors 2 and 3 are extended in the direction of the electrodes, viz. the anode 4 and the cathode 5, beyond the latter by the members 17 and 18 up to the short-circuit capacity 19. It is evident that such shutting off of the line of energy towards the press will permit only a minimum of high frequency energy to escape in the direction of the press, particularly if, as shown, the current carrying conductors 9, 10, 11 are disposed in the shadow of the conductors of the line of energy and for that reason cannot be induced by the electromagnetic field extending preferably between the conductors 2, 3 or 17, 18. If, as is usually the case, there are stationary waves on the line of energy besides travelling waves, the point where the wall of the vacuum vessel crosses the line may be placed in a potential node or loop according to whether a small disturbance of the electric field or a small current load at the point of separation of the line of energy is desired.

I claim:—

1. A short wave electric discharge tube comprising a vacuum vessel and electrodes, one electrode being an incandescible cathode, feed wires to the electrodes passing through the vacuum vessel, and a two conductor system for high frequency energy, each individual conductor of said two conductor system consisting of two parts, one of said parts conductively connected with one electrode and located within the vacuum vessel, the other of said parts disposed without the vacuum vessel, said inner parts and outer parts having the wall of the tube therebetween as an insulating layer.

2. A short wave electric discharge tube as claimed in claim 1, an antenna disposed adjacent the ends of said two conductor system and electrically connected thereto.

3. A short wave electric discharge tube as claimed in claim 1 and a short circuit condenser bridging over the ends of said two conductor system adjacent the electrodes.

4. A short wave electric discharge tube comprising a vacuum vessel and electrodes, one electrode being an incandescible cathode, feed wires to the electrodes passing through the vacuum vessel and connected to two electrodes, a two conductor system for high frequency energy, each individual conductor of said two conductor system consisting of two parts, one of said parts conductively connected with an electrode and located within the vacuum vessel, the other of said parts disposed without the vacuum vessel, said inner and outer parts having the wall of the tube therebetween as an insulating layer, said conductor parts being formed as condenser plates adjacent said wall.

5. A short wave tube as claimed in claim 4, said condenser plates consisting of silver coatings on the wall of the vessel.

6. A short wave electric discharge tube comprising a vacuum vessel, two electrodes therein, a two-part metallic band extending from each electrode to form a high frequency lead, said bands diverging from each other as their length increases, each of said leads having one part disposed within said vessel and a second part without said vessel, the former being insulated from the latter by the wall of the vessel.

7. A short wave electric discharge tube comprising a vacuum vessel, two electrodes therein and a two part high frequency lead extending from each electrode, each of said leads having one part disposed within said vessel and a second part without said vessel and being a rectilinear continuation of the inner part, the former being insulated from the latter by the wall of the vessel.

8. A short wave electric discharge tube comprising a vacuum vessel and electrodes, one electrode being an incandescible cathode, feed wires to the electrodes passing through the vacuum vessel and connected to two electrodes, a two conductor system for high frequency energy, each individual conductor of said two conductor system consisting of two parts, one of said parts conductively connected with an electrode and located within the vacuum vessel, said inner and outer parts having the wall of the tube therebetween as an insulating layer, said conductor parts being formed as condenser plates adjacent said wall, one surface of said wall being completely covered with metal.

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