

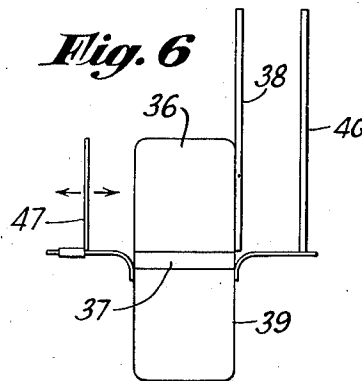
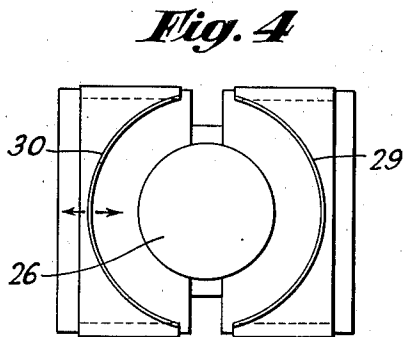
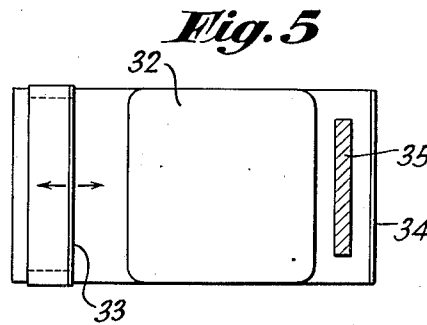
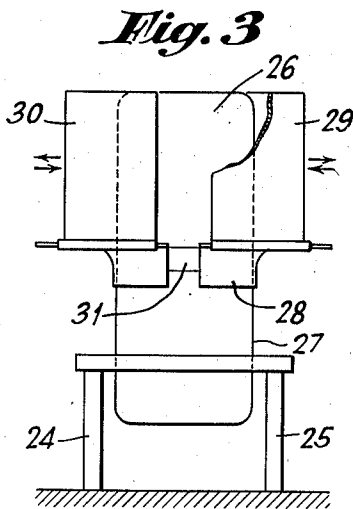
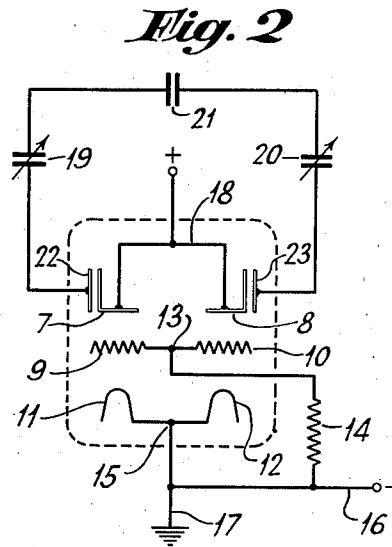
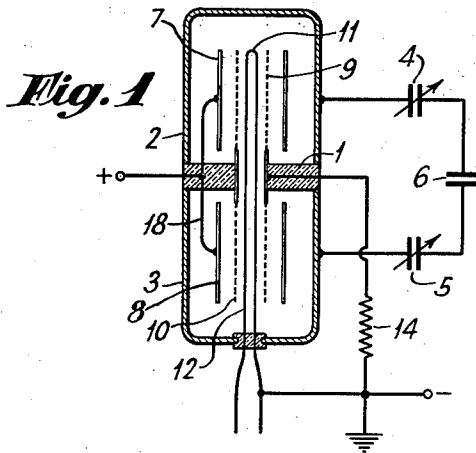
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HIGH FREQUENCY OSCILLATOR

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UNITED STATES PATENT OFFICE

2,153,131

HIGH FREQUENCY OSCILLATOR

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5 Claims. (Cl. 250—27.5)

My invention relates to electron discharge devices, more particularly to tubes suitable for operation at high frequencies and their associated circuit elements.

In a number of cases where generator tubes are used for the production of oscillations of high frequency, the load consists of a condenser connected in the associated circuit. This is the case for instance where radio frequency energy is to be used for the drying of materials such as wood, tobacco, and the like. With a view to increasing the efficiency of operation and the effect of heating, it is found to be very desirable to work with the shortest possible waves. However, a limitation is imposed in this respect by the inductance or capacitance contained in the load circuit, and this limitation can not be eliminated with the usual arrangements known in the art.

It is the principal object of my invention to provide an electron discharge device and associated circuit elements useful at high frequencies and particularly suitable for inducing heat.

The invention involves the use of a special tube for the production of ultra-short waves, part of the tube forming a part of the load circuit. For the production of ultra-short waves, according to the invention, recourse is had to a type of push-pull tube in which the two electrode systems operating in push-pull are accommodated within a metallic wall or shell which, by an insulation partition, is divided into two electrically separated halves, arrangements being so made that each of these two shell or wall parts or halves forms a coupling condenser conjointly with a respective anode or plate, the load circuit being associated with the resultant condenser. One advantage in addition to others of such a type of tube, is primarily that it is not necessary to call upon the seals to carry RF energy. According to another object of this invention, the metallic wall or shell of the tubes serves at the same time as a plate for the load condenser, while opposite the same another plate is mounted in a suitable manner.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims, but the invention itself will best be understood by reference to the following description taken in connection with the accompanying drawing in which Figure 1 shows a schematic vertical section of an electron discharge device used with my invention and its associated circuit elements, Figure 2 is a schematic circuit diagram using the electron discharge device shown in Figure 1, Figure 3 shows one form of electron discharge device made according to my invention, Figure 4 is a top view of Figure 3, Figure 5 is a top view of a modification of an electron discharge device made according to my invention, and Figure 6 shows a

still further modification of an electron discharge device made according to my invention.

In Figure 1 the tube is provided with a metallic outer wall or shell forming the envelope of the tube and divided by the insulator 1 into two electrically separated parts 2 and 3 containing cathodes 11, 12, grids 9, 10 and anodes 7 and 8. Each of the shells forms a coupling condenser conjointly with the respective anodes of the push-pull tube confined within the discharge vessel. Associated with the parts 2 and 3 by way of tuning condensers 4 and 5 is the load condenser 6.

Figure 2 shows the fundamental circuit organization. The push-pull system consists of the anodes 7 and 8, respectively, the grids 9 and 10 forming a joint construction element, and the two cathodes 11 and 12. At the point of symmetry 13 of the two grids is connected a lead which is brought by way of the grid leak 14, to the point of symmetry of the junction between the two cathodes 15 and the lead 16 with the negative pole of the D. C. source of supply, on the one hand, and the grounding terminal, on the other hand. The two anodes 7 and 8 are interconnected by way of the clip 18, the inductance of which governs the resulting wavelength or frequency. To the point of symmetry of the said clip is connected the lead brought to the positive pole of the D. C. source of potential supply. The load condenser 21 is connected to the tube by the tuning condensers 19 and 20. The condenser plates 22 and 23 correspond to the coupling elements 2 and 3, Figure 1.

Figure 3 shows a tube which, so far as its circuit layout is concerned, corresponds to Figure 2. According to the invention, it is constructionally united with the load condenser. The tube, for instance, may be supported by insulator supports 24 and 25. One metal bulb 26 of the push-pull tube is used to function as a plate of the load condenser. With the other metallic bulb 27 is connected the second plate 29 of the load condenser by way of the metallic intermediate piece 28. In the preferred use of the device, that is, for the drying of wood, tobacco, or other materials, the material to be dehydrated is placed between the metallic bulb 26 and the outer plates 29 and 30. In other words, the load condenser is formed between the metallic bulb 26 and the said two plates. The latter must be so positioned in relation to the insulator 31 that there will be no difficulty in bringing out the necessary leads.

Figure 4 is a top view of the arrangement. The two outer plates 29 and 30 are laterally shiftable so that by alteration of the spacing of these two plates with respect to the metallic bulb 26, the load circuit is tuned to the generator circuit. The merit of this arrangement is that the shortest imaginable connections of the whole RF circuit are realized; moreover, it resides in the fact

that the load condenser, in case of resonance, must absorb practically the whole radio frequency energy output. Radiation losses and other undesirable losses due to ground capacities occurring in circuit organizations are here avoided.

Inasmuch as the form of consumer or load condenser shown in Figures 3 and 4 cannot be realized in all practical cases, it will often be found advantageous to choose a rectangular form for the metallic envelope forming the outer wall or shell of the generator tube rather than circular or cylindrical form. This offers the practical advantage that the load condenser may be given the form of a flat plate condenser. An arrangement of this kind is shown in Figure 5. Upon both sides of the metallic bulb 32 are shiftably mounted the condenser plates 32 and 34. In the gap between the metallic bulb and the plates is inserted the load condenser. However, it will be found greatly advantageous, if, as shown in Figure 5, the load 35 is introduced only on one side, and if the spacing of plate 34 is kept at a constant value for a given load (such as wood, tobacco, etc.), while the other plate 33 is made shiftable for the purpose of tuning.

Inasmuch as a great many loads are substantially larger in their physical dimensions or volume than the space available in the embodiments here disclosed, the lateral surfaces of the load condenser may be enlarged in these cases as illustrated in Figure 6. In this arrangement an extension surface 38 is connected with the bulb 36 of the tube 37, and facing the same is a condenser plate 40 associated with the other bulb 39. Tuning is effected by shifting the condenser plate 41 mounted upon the opposite side.

It will be understood that also in this case the electrodes may be made of a different shape, say, cylindrical or partly cylindrical. At all events the aim should be to adapt the form of the load electrodes to the particular use and purpose of the device.

While I have indicated the preferred embodiments of my invention of which I am now aware and have also indicated only one specific application for which my invention may be employed, it will be apparent that my invention is by no means limited to the exact forms illustrated or the use indicated, but that many variations may be made in the particular structure used and the purpose for which it is employed without departing from the scope of my invention as set forth in the appended claims.

I claim:

1. An electron discharge device having an envelope comprising a pair of metallic cup-shaped members and an insulating member sealing the open ends of said cup-shaped members together, a pair of oppositely disposed electrode mount assemblies including a cathode and anode enclosed within said envelope, each of said cup-shaped members being capacitively associated with a different one of said anodes and a metallic member supported by and electrically connected to one of said cup-shaped members and extending toward and opposite the other cup-shaped member in spaced relationship to form with the other cup-shaped member an oscillating load circuit for said electron discharge device.

2. An electron discharge device having an envelope comprising a pair of metallic cup-shaped members and an insulating member sealing their

open ends together, a pair of oppositely disposed electrode mount assemblies each including a cathode and anode within said envelope, each of said cup-shaped members being capacitively associated with a different one of said anodes, and a pair of oppositely disposed metallic members positioned on opposite sides of said envelope and supported by and electrically connected to said one of said cup-shaped members and extending toward and opposite said other cup-shaped member in spaced relationship to form with the other cup-shaped member an oscillating load circuit for said electron discharge device.

3. An electron discharge device having an envelope comprising a pair of metallic cup-shaped members and an insulating member sealing their open ends together, a pair of oppositely disposed electrode mount assemblies each including a cathode and anode enclosed within said envelope, each of said cup-shaped members being capacitively associated with a different one of said anodes, and a pair of oppositely disposed metallic members positioned on opposite sides of said envelope and slidably supported by and electrically connected to said one of said cup-shaped members and extending toward and opposite said other cup-shaped member in spaced relationship to form with the other cup-shaped member an oscillating load circuit for said electron discharge device, said slidably supported metallic members being slidable to vary the spacing between said members and said cup-shaped member.

4. An electron discharge device having a tubular envelope comprising a pair of metallic cup-shaped members and an insulating member sealing their open ends together, a pair of oppositely disposed electrode mount assemblies including a cathode and anode enclosed within said envelope, each of said cup-shaped members being capacitively associated with a different one of said anodes, and a pair of oppositely disposed semi-circular metallic members positioned on opposite sides of said electron discharge device and supported by and electrically connected to said one of said cup-shaped members and extending toward and opposite said other cup-shaped member in spaced relationship to form with the other cup-shaped member an oscillating load circuit for said electron discharge device.

5. An electron discharge device having an envelope comprising a pair of metallic cup-shaped members and an insulating member sealing their open ends together, a pair of oppositely disposed electrode mount assemblies including a cathode and anode enclosed within said envelope, each of said cup-shaped members being capacitively associated with a different one of said anodes, and a pair of oppositely disposed metallic members positioned on opposite sides of said electron discharge device and supported by and electrically connected to said one of said cup-shaped members and extending toward and opposite said other cup-shaped member in spaced relationship to form with the other cup-shaped member an oscillating load circuit for said electron discharge device, and metallic extension members connected to one of said pair of oppositely disposed metallic members and to the spaced cup-shaped member for increasing the surface area forming the oscillating load circuit.

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