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QUARTZ OSCILLATOR FOR CONTROLLING TRANSMITTER VALVES AND OSCILLATION GENERATORS

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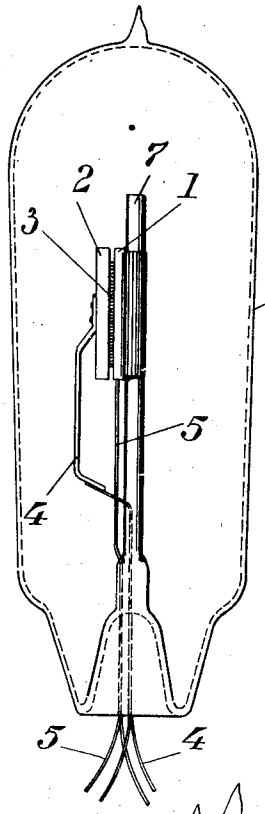


Fig. 1.

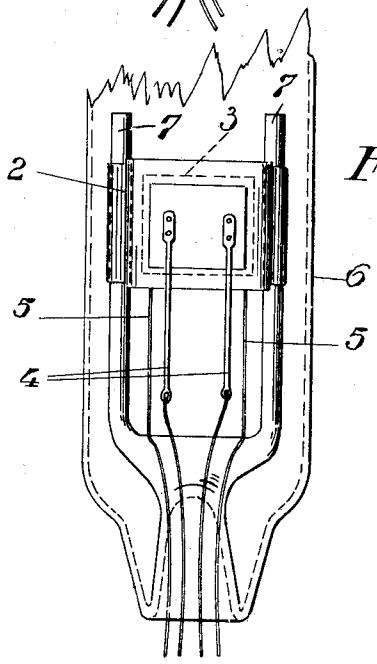


Fig. 2.

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UNITED STATES PATENT OFFICE

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QUARTZ OSCILLATOR FOR CONTROLLING TRANSMITTER VALVES AND OSCILLATION GENERATORS

Application filed March 22, 1928, Serial No. 263,701, and in Germany March 18, 1927.

My invention relates to piezoelectrical crystals such as quartz which may be used by means of effects of resonance as oscillators for controlling transmitter valves and oscillation generators or as resonators for controlling the frequency of any kind of oscillations.

It is a well known fact that valve transmitters for wireless telegraphy may be controlled by quartz crystals. It has not, however, been possible hitherto with the aid of the quartz directly to control considerable amounts of energy, as are transmitted by high power valves, therefore using piezoelectrical crystals was limited to comparatively low power. By developing and technically improving the circuits means have already been formed for directly controlling with the quartz larger valves too of the order of 100 watt and above. In doing so, it has, however, been discovered that the quartz crystal is subjected to much heating already by the considerable amplitudes and, perhaps, also by dielectric losses. This heating is very disadvantageous to the permanent working of such quartz controlled transmitters. According to my invention such permanent operations may be carried through also with direct controlling of powerful valves by oscillating quartz crystals if special cooling surfaces are used for draining off the heat arising, more particularly, however, also if the quartz is made mechanically large enough in order to allow of such cooling surfaces being effectively used. In this respect great advantages are derived from the fact that the natural electrical oscillation, which is important for the working of the crystal as an oscillator and as a resonator, depends essentially only upon the dimension in the direction of the electric axis while the directions of the quartz crystal lying at right angles thereto are without any considerable influence upon the frequency of wave length. By merely increasing the size of the quartz crystal it is therefore possible to use effective cooling surfaces in order to allow of the controlled power being magnified. Appropriately the cooling surfaces are arranged as electrodes for the quartz crystal.

My invention may be best understood with reference to the accompanying drawings. In the drawings:

Figure 1 shows a piezoelectrical oscillator device arranged in a glass-vessel, the quartz being seen from such a side that the electrical axis of the quartz is lying in the plane of the drawings.

Figure 2 shows the same device from a direction perpendicular to that of Figure 1, the electrical axis of the quartz being arranged perpendicularly to the plane of the drawings. In Figure 2 the upper part of the glass vessel is broken off.

In the drawings a piezoelectrical crystal 3 is arranged between the two rectangular metal plates 1 and 2 which lie in parallel planes plate 1 being supported by standards 7 sealed on the press of the valve. This quartz is shaped in such a way that it forms a thin plate of exactly even thickness; the electrical axis of the quartz lying in the direction perpendicular to the planes of the two metal-plates and therefore in the direction of the shortest dimension of the crystal. In Figure 2 by means of dotted lines the rectangular shape of the quartz is to be seen. The metal plates 2 and 3 are large enough to provide a good cooling effect for the crystal if it gets hot when oscillating. The electrodes 4 and 5 are connected to the metal-plates 2 and 3 in such a way that they are able to bring up the electrical oscillation to the sides of the crystal. For this purpose the electrodes 4 and 5 are performed as springs as the figures illustrate, the metal-plates 2 and 3 operating in the device at the same time as electrodes as shown in the drawings. The whole device is arranged in a glass vessel 6 which is preferably highly evacuated in order to avoid uncontrollable discharges between the electrodes.

However, it may be useful after evacuating the vessel to fill it with a kind of gases such as helium or a combination of helium and neon. Thus, if the great amplitudes of the oscillation arise this will be indicated by lighting effects between the electrodes and the quartz caused by ionizations of said gases.

I claim:

A piezo-electric oscillator for high energy

arranged in a vacuum vessel consisting of two metal plates, of one piezo-electric crystal plate arranged between said metal plates, of leading wires to said metal plates introduced into the vessel, and of two standards of glass sealed to the press of said vessel and supporting one of said metal plates, the wires leading to that electrode which is not supported by standards, being bent in order to produce a pressure on the crystal placed between them.

In testimony whereof I have affixed my signature.

HEINRICH EBERHARD.