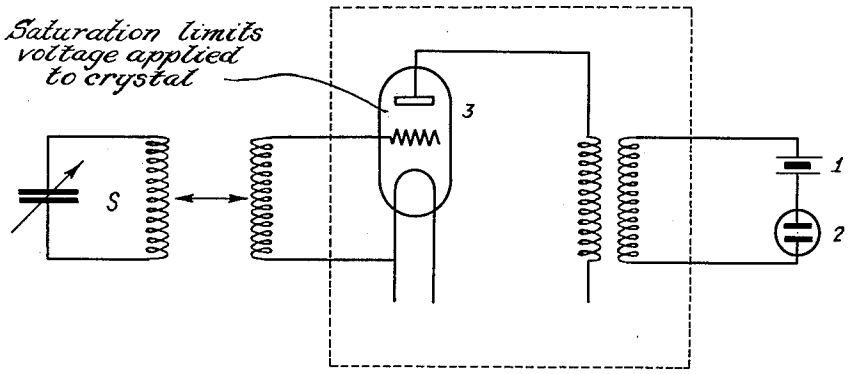
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OVERLOAD PROTECTION MEANS FOR PIEZO ELECTRIC CRYSTALS

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INVENTOR
FRITZ MICHELSSEN
BY Ira J. Adams
ATTORNEY

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OVERLOAD PROTECTION MEANS FOR PIEZO-ELECTRIC CRYSTALS

Fritz Michelssen, Berlin, Germany, assignor to Telefunken Gesellschaft Für Drahtlose Telegraphie m. b. H., Berlin, Germany, a Corporation of Germany

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5 Claims. (Cl. 250—39)

The present invention relates to a device for protecting piezo-electric crystals whereby the chances of undue vibration of the crystal with the consequent destruction thereof is automatically prevented. This is obtained by connecting a so-called limiting tube in series with the crystal.

It has been found in practice that in case of a sudden increase in energy of the transmitter comprising a quartz crystal coupled therewith the crystal becomes overloaded and bursts. By the insertion of an electronic tube of proper dimensions, that is, of appropriate saturation current, in series with the crystal a simple means adapted to preclude overloading, is furnished, the electron tube serving as a limiting device. If with such an apparatus, in the presence of a certain transmitter energy, the coupling is so set that the tube is operating at its saturation point, then, in case of suddenly increased transmitter energy, no larger load can be imparted to the crystal.

The accompanying drawing illustrates one embodiment of the basic idea here disclosed by way of example.

S denotes the transmitter which is to be coupled with the quartz crystal 1. The glow-discharge lamp 2 is connected in series therewith to indicate resonance. The coupling takes place by way of the limiting tube 3 in the manner indicated in the drawing.

That is, the amount of energy transferred from transmitter S to crystal 1 should be limited by the saturation of tube 3 so that crystal 1 will not be in danger of over-energization.

This scheme, of course, is not confined to being applied to crystal-controlled tube transmitters or transmitter valves, but will be found useful also in all such cases where the crystals are employed for wave measurement, for instance, for crystals with a rectifier tube or detector connected therewith.

The present invention, of course, is particularly suited as a frequency indicator, indicating when the source S corresponds in frequency to the frequency of the piezo-electric crystal 1, although it is to be clearly understood, of course, that this invention is not to be limited to this particular use.

I claim as my invention:

1. An arrangement to protect piezo-electric crystals from overloads, characterized by the feature that a limiting tube is connected effectively in series with the crystal for radio frequencies applied thereto which limiting tube is adjusted to become saturated upon presence of excessive voltages, thereby limiting the voltage applied to the crystal to a safe value.

2. A piezo-electric oscillating system comprising in combination, a source of radio frequency energy, a vacuum tube coupled to said source, and a piezo-electric crystal oscillator coupled to said vacuum tube, said vacuum tube being adjusted normally to operate at its saturation point, whereby to effect the energization of said crystal by said source.

3. A piezo-electric oscillating system comprising in combination, a source of alternating current energy, a vacuum tube coupled to said source, a piezo-electric crystal oscillator coupled to said vacuum tube, said vacuum tube being adjusted normally to operate at its saturation point, whereby to effect the energization of said crystal by said source, and a glow discharge lamp connected in series with said piezo-electric oscillator.

4. In a system for undulatory electrical currents, a source of undulatory electrical currents, an electron discharge device having within an evacuated container, an anode, a cathode, and a grid, an input circuit coupled to said grid and cathode, means for coupling said source to said input circuit, an output circuit across said anode and cathode, a piezo-electric crystal coupled to said output circuit, and, a glow discharge device associated with said crystal for indicating the application of potentials corresponding to a natural frequency of vibration, to said crystals, said electron discharge device being adjusted to become saturated upon the presence of excessive potentials thereby preventing overloading of said piezo-electric crystal.

5. In a frequency indicating system, a source of undulatory electrical energy, a piezo-electric crystal and a glow discharge device in series, and means for coupling said series combination to said source, said means comprising an electron discharge device having an evacuated container wherein are contained an anode a cathode and a grid, the excitation and polarization of the electrodes of said electron discharge device being such that application of energy of a value sufficient to break down said crystal is prevented by saturation of said electron discharge device.

FRITZ MICHELSSEN.