

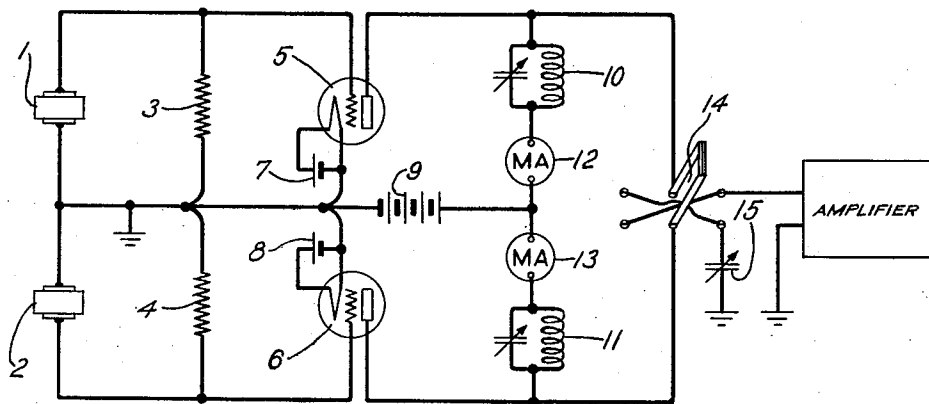
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OSCILLATION GENERATOR

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OSCILLATION GENERATOR

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This invention relates to oscillation generators and particularly to those whose frequency is controlled by a mechanical vibrating element such as a piezo electric crystal. Such generators are in wide use and are particularly adapted to systems in which it is necessary to maintain the frequency constant within narrow limits as, for example, in high frequency radio signaling systems.

In connection with such a system, a spare crystal may be provided which has been designed to vibrate at the same frequency as the working crystal, and means may be provided to switch the spare crystal into operation when desired, as in the case of a failure of the working crystal. The frequency of vibration of a crystal is a function of its temperature, and the temperature of the crystal in turn is a function of the amplitude of its vibrations and of the impedance of the circuit into which the crystal is vibrating.

If a spare crystal which has been idle is switched into an oscillator circuit and caused to vibrate, there will be a change in its temperature and a corresponding change in its frequency of vibration. This not only changes the frequency of the oscillator, but necessitates a readjustment of the circuit to maintain oscillation at the changed frequency.

If means are provided to maintain the spare crystal in vibration, and it is then switched into the oscillator circuit, there will be a change in its frequency of vibration due to the difference in the impedance of the load into which the crystal is vibrating, with at least qualitatively, the same effect as before.

It is the object of this invention to provide means for switching the spare crystal into an oscillator circuit without affecting the operation of the circuit.

This may be accomplished by providing a separate oscillating circuit for the spare crystal, and a dummy load into which it may vibrate which has the same characteristics as the load into which the working crystal is vibrating.

Additional features of the invention and characteristics of its operation will appear from the following detailed description when

read with the accompanying drawing, the single figure of which illustrates a preferred embodiment of the invention.

The figure of the drawing is a diagram of the circuits of two crystal controlled oscillators and an amplifier which may be associated with a radio transmitting or receiving system or other suitable apparatus. Two mechanical vibrating elements 1 and 2, having the same frequency characteristics, which may be piezo-electric crystals, and are preferably maintained at the same constant temperature, are connected across resistances 3 and 4 respectively in the input circuits of electric space discharge devices 5 and 6 having cathode, anode and control electrodes. The cathodes are heated by batteries 7 and 8. A common battery 9 supplies plate current for the two oscillators. Separate output circuits include respectively tuned circuits 10 and 11 and milliammeters 12 and 13. A lead from the plate of each tube is connected to a separate terminal on a double pole double throw switch 14. When the switch is closed in the position to the right, the oscillator of tube 5 is connected to the amplifier shown in block, and the oscillator of tube 6 is connected to a variable condenser 15. When the switch 14 is thrown to the left, the oscillator of tube 5 is connected to the condenser 15, and the oscillator of tube 6 is connected to the amplifier. The condenser 15 may be adjusted by varying its capacity until it simulates the impedance of the amplifier.

Assuming the oscillator of tube 5 is being used as the working oscillator, the switch will then be closed to the right. Both the oscillators are vibrating however, and they are operating into equivalent loads. If it is desired to switch crystals, as in the case of a failure of the oscillator of tube 5 due to a breakdown of the crystal 1 or for any other reason, the switch 14 is thrown to the left, and the apparatus continues to operate exactly as before except that the oscillator of tube 6, controlled by crystal 2, now supplies the oscillations for the system, while the oscillator of tube 5 controlled by crystal 1 operates into the dummy load constituted by condenser 15.

Crystal controlled oscillators are particu-

larly advantageous at high frequencies, due to the difficulty in maintaining oscillations constant at such frequencies by any other means. When used at high frequencies a balanced amplifier should be used to prevent reaction in the amplifier, or from the amplifier to the oscillator, which would tend to cause a change in the crystal frequency.

What is claimed is:

10 1. An oscillation producing system comprising a crystal controlled oscillator, a work circuit connected thereto, a spare crystal controlled oscillator, means to substitute said spare oscillator for said first mentioned oscillator, and means associated with said spare
15 oscillator prior to the substitution to subject the spare oscillator to the same electrical conditions as said first mentioned oscillator whereby upon substitution of said spare oscillator the amplitude of the oscillations supplied to said work circuit will not undergo
20 change.

2. A mechanically controlled oscillation generator a second mechanically controlled
25 oscillation generator, an electrical circuit connected to the output of said oscillation generator, a dummy load circuit of the same impedance as said electrical circuit connected to the output of said second oscillation generator, and switching means for simultaneously
30 transposing said connections.

3. A crystal controlled oscillation generator, a spare crystal therefor, means for maintaining said spare crystal in vibration, and
35 means for switching said spare crystal into the circuit of said generator without affecting the amplitude of vibration of the crystal.

In witness whereof, I hereunto subscribe my name this 10th day of June, 1930.

40 CHARLES F. P. ROSE.

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