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OSCILLATION GENERATION SYSTEM

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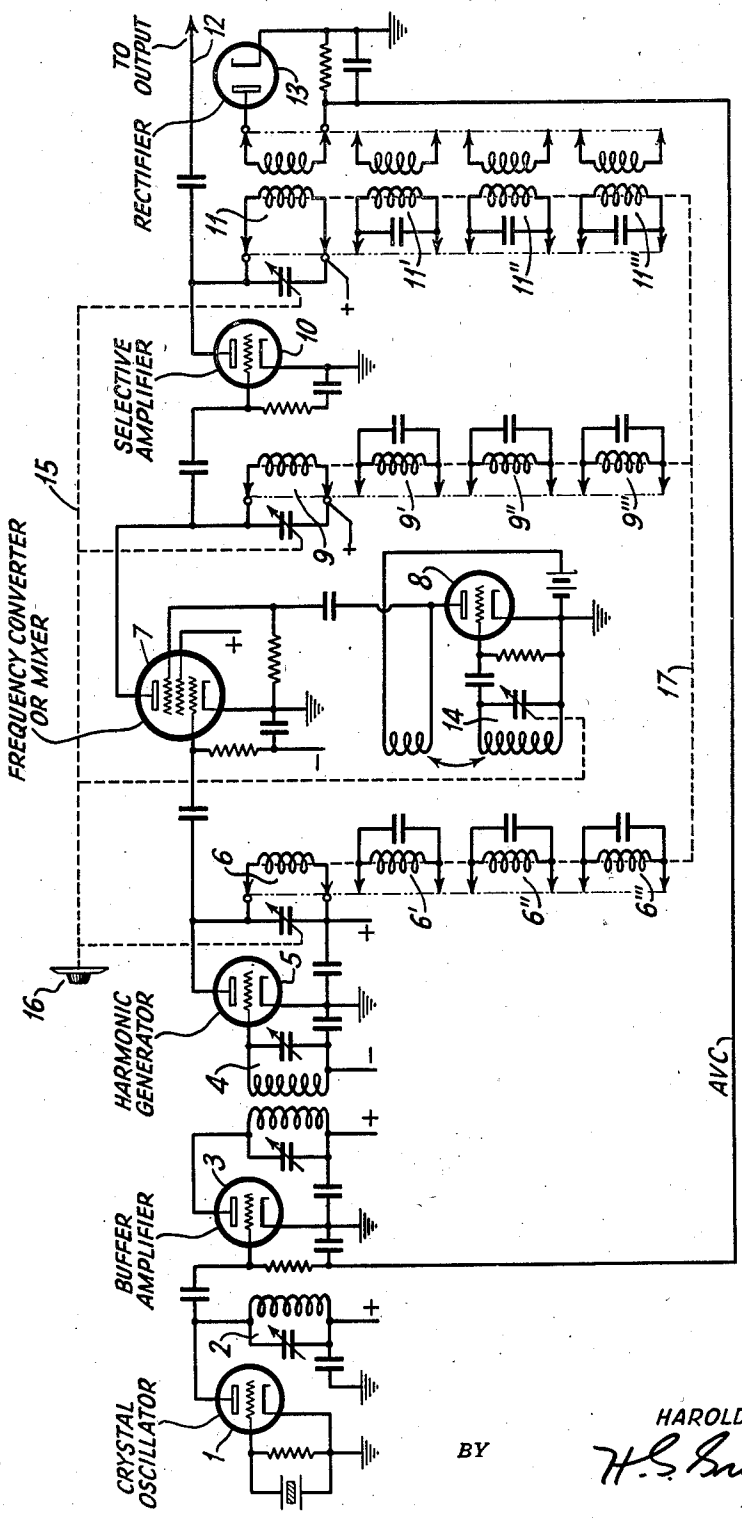

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OSCILLATION GENERATION SYSTEM

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4 Claims. (Cl. 250—36)

This invention relates to a stabilized, wide range, high frequency oscillation generation system.

One of the objects of the invention is to provide a compact oscillation generator of continuously adjustable wide frequency range having a superior degree of frequency stability than conventional wide range frequency oscillators, and having adjustable selective circuits in the path of the output frequency.

Another object is to provide a highly stabilized wide frequency range oscillation generator composed of a crystal oscillator, a harmonic generator, and an adjustable oscillator so constructed and arranged that the range of variable frequency is restricted, whereby at the higher frequencies most of the high frequency range is contributed by the harmonic generator output, thus minimizing any tendency for instability.

Briefly stated, the invention comprises a high frequency generator in which the output is produced by beating a variable frequency oscillator against a selected harmonic of a crystal oscillator. Selectivity is provided to insure that the generator output consists of only one frequency which is either the sum or the difference, preferably the sum, of the selected harmonic of the crystal oscillator and the frequency of the adjustable oscillator. A very high frequency stability is achieved by causing the harmonic generator, in turn stabilized by the crystal oscillator, to contribute most of the frequency range. If desired, substantial constancy of generator output over the entire frequency range may be obtained by means of an automatic volume control circuit.

A feature of the invention resides in the arrangement whereby a switch selects certain crystal frequency harmonics and also selects suitable tuned circuits consisting of capacitances and inductances in the selective output circuits. These can be so designed that the selective output circuits will, for each harmonic selected, cover the same tuning range as the variable frequency oscillator.

The following is a more detailed description of the invention in conjunction with a drawing whose single figure shows the highly stabilized, wide frequency range oscillator of the invention.

In the drawing, there is shown a crystal oscillator 1 whose output energy is resonated in tuned circuit 2 and thence fed into a coupling or buffer amplifier tube 3 from which the amplified and stabilized crystal frequency is fed to the tuned input circuit 4 (tuned to the crystal frequency) of a harmonic generator 5. The output of harmonic generator 5 is resonated in tuned circuit 6, tuned to the harmonic frequency, and then fed to the control grid of a pentode frequency converter or mixer tube 7 to one of whose other grids the output frequency of a variable oscillator 8 is fed. The sum or difference of the selected harmonic and the frequency of the beating oscillator 8 is selected in the tuned output 9 of the frequency converter tube and fed through an amplifier 10 to the selective tuned circuit 11 from which output energy for utilization purposes is derived over lead 12. It is preferred, however, that the output of the converter tube 7 comprise at least two selective stages. A rectifier 13 rectifies a portion of the selective output of the generator system and feeds back the rectified energy over the AVC lead to the grid of the coupling or buffer tube 3 to insure substantial constancy of amplitude output over the entire frequency range in the manner of an automatic volume control circuit.

The selective output circuits 6, 9 and 11, as well as the tuned circuit 14 of the variable oscillator 8, are ganged or unicontrolled by means of a shaft 15, in turn linked to a calibrated dial 16.

The selective circuits 6, 9 and 11 each comprise a plug-in coil wound on the same form as other plug-in coils so that any one desired coil can be positioned to be effective in its respective circuit. As an illustration, the plug-in coil of tuned circuit 6 is wound on the same form as are plug-in coils 6', 6'', 6''' and many others, so that any one of these coils can be slid into position to make electrical contact with the tuned circuit. If desired, padding condensers may be provided in shunt to the plug-in coils, as shown. Similarly, plug-in coils 9', 9'', 9''' etc. and 11', 11'', 11''' etc. are respectively positioned on the same forms as the coils of tuned circuits 9 and 11. In the case of coils 11, 11' etc., there are actually provided two plug-in coils for each position of the form upon which they are wound, one coil for tuned circuit 11 and another coil coupled thereto for the rectifier 13. The coils of all these selective circuits are ganged or unicontrolled by means of a shaft or selector circuit switch 17, and are so designed that the respective selective output circuits will, for each harmonic selected, cover the same tuning range as the variable frequency oscillator.

The frequency range of the variable oscillator 8 is at least equal to the fundamental frequency of the crystal so as to bridge the frequencies of

any two adjacent harmonics of tube 5. It is thus readily possible to have the final output frequency read directly from the setting of the selector circuit switch 17 and the calibrated dial 16 of the variable oscillator 8.

As an illustration of one design the oscillation generation system of the invention may take, the crystal element may consist of a 129B, V cut, controlling oscillator 1; the harmonic generator 5 may have a selective output providing in seventeen steps a range of frequencies from 3 to 19 megacycles; the variable oscillator 8 may have a range of oscillations from 2 to 3 megacycles; the frequency converter tube 7 may have a selective output providing in seventeen steps a range of frequencies from 5 to 22 megacycles, equivalent to the sum of the selected harmonic of the crystal oscillator and the frequency of the adjustable oscillator 8; the dial 16 may read from 0 to 1000 kilocycles; and the final output of the generator system will have an output of frequencies ranging from 5 to 22 megacycles. Thus, if each tap of the selector switch 17 causes a difference in selective output of 1000 kilocycles, and if the selector switch 17 is placed on tap #7, and the variable oscillator dial 16 reads 500 kilocycles, we will have a generated output frequency of 7500 kilocycles.

What is claimed is:

1. A high frequency oscillation generator system whose output over a wide frequency range is accurate within n cycles, a variable frequency oscillator whose maximum frequency is relatively low compared to the maximum output frequency of said system and whose variation in frequency stability does not exceed said n cycles, a stabilized oscillator whose frequency is not greater than the maximum frequency of said variable oscillator, the frequency range of said variable frequency oscillator being at least equal to the fundamental frequency of the stabilized oscillator, a frequency multiplier coupled to said stabilized oscillator, said multiplier being adjustable to produce a wide range of frequencies, and means for mixing the frequency from said multiplier and the frequency from said variable oscillator to produce a beat frequency constituting the output of said system, the frequency range of said variable oscillator being restricted compared to the frequency range of said multiplier and said system.

2. A stabilized high frequency oscillation generator system whose output over a wide frequency range is accurate within n cycles, comprising a variable frequency oscillator whose maximum frequency is relatively low compared to the maximum output frequency of said system and whose variation in frequency stability lies within said n cycles, a crystal controlled constant frequency oscillator producing a frequency not greater than the maximum frequency of said variable oscillator, the frequency range of said variable frequency oscillator being at least equal to the fundamental frequency of the crystal oscillator, a harmonic generator coupled to said crystal oscillator and having a selective output circuit, a frequency converter for mixing the harmonic frequency of said harmonic generator and the frequency of said variable frequency oscillator for producing a beat frequency, and an adjustable selective output circuit coupled to said frequency converter, said selective output circuits and said variable oscillator being so constructed and arranged that the variable frequency range of said variable frequency oscillator is restricted compared to the frequency range of said harmonic generator, and most of the frequency range of the output of said system is contributed by the selective output of said harmonic generator, said selective output circuits having at least the same tuning range as said variable frequency oscillator for each harmonic selected.

3. A stabilized high frequency oscillation generator system of wide frequency range comprising a variable frequency oscillator whose maximum frequency is relatively low compared to the maximum output frequency of said system, a crystal controlled constant frequency oscillator producing a frequency which does not exceed the maximum frequency of said variable oscillator, the frequency range of said variable frequency oscillator being at least equal to the fundamental frequency of the crystal oscillator, a harmonic generator coupled to said crystal oscillator and having a selective output circuit, a frequency converted for mixing the output frequency of said harmonic generator and the frequency from said variable frequency oscillator to provide a beat frequency therebetween, and an adjustable selective output circuit for said frequency converter, said adjustable selective output circuits having at least the same tuning range as said variable frequency oscillator for each harmonic frequency selected, and unicontrol means for both of said selective output circuits; said variable oscillator and said unicontrol means each being provided with dials, whereby the output frequency from said system is directly readable from the settings of said dials.

4. A high frequency oscillation generator system whose output over a range of 3 to 19 megacycles is accurate within n cycles, a variable frequency oscillator having a range from about 2 to 3 megacycles and whose variation in frequency stability does not exceed n cycles, a stabilized oscillator whose frequency does not exceed 3 megacycles, the frequency range of said variable frequency oscillator being at least equal to the fundamental frequency of the stabilized oscillator, a harmonic generator coupled to the output of said stabilized oscillator and having a range of 5 to 22 megacycles, a frequency converter for mixing the harmonic from said harmonic generator and the output frequency from said variable oscillator, said harmonic generator for each harmonic frequency selected and said converter having a tuning range equal to the tuning range of said variable oscillator, and unicontrol means for said converter, harmonic generator and said variable oscillator.

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