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CALIBRATING MEANS FOR A RADIO RECEIVER

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Fig. 2

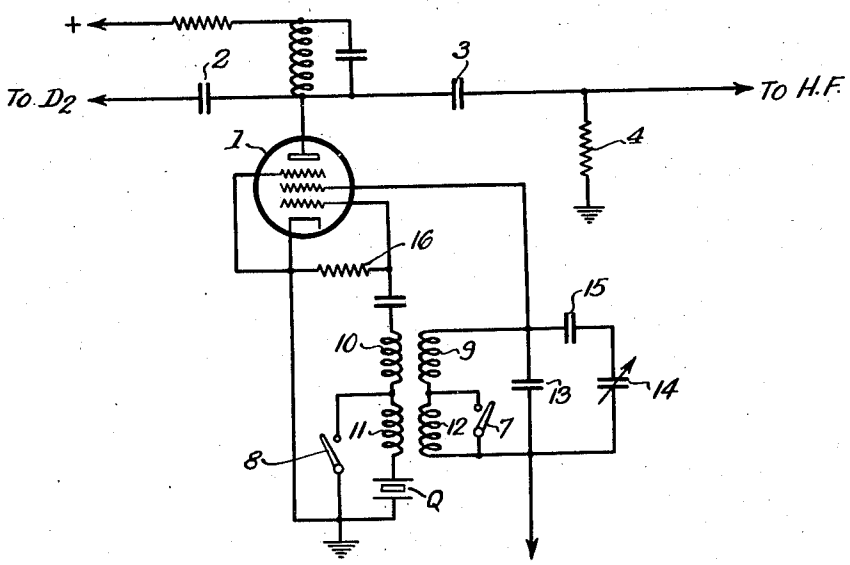
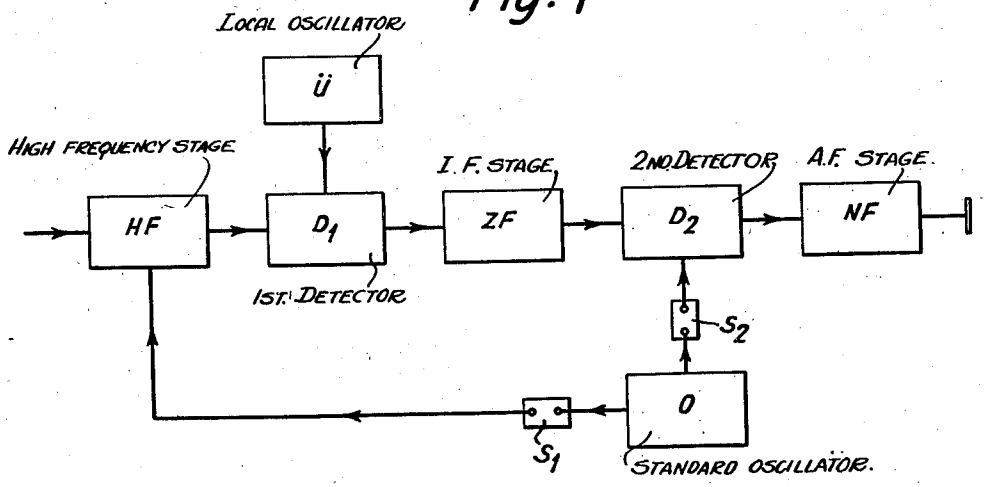


Fig. 1



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CALIBRATING MEANS FOR A RADIO RECEIVER

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5 Claims. (Cl. 250—20)

In receivers in which the wave length or frequency of the energy received is to be ascertained with a high accuracy it is necessary to check up frequently on the calibration of the receiver and to this end such receivers are provided with an oscillator having a particularly stable frequency and which furnishes the calibrating frequencies. Ordinarily as oscillator a quartz-controlled tube generator is employed whose plate current is distorted and contains many harmonics of the oscillation of the quartz crystal. These harmonics then serve as the calibrating frequencies. In the accompanying drawing, Figure 1 illustrates in schematic form a receiver incorporating the features of the present invention; and, Figure 2 illustrates in diagrammatic form an oscillator which may be used in the system shown in Figure 1. A receiver equipped with such a special generator has a circuit as shown in principle in Figure 1. This circuit comprises a high-frequency stage HF, a local oscillator U, a first detector D_1, an intermediate frequency stage ZF, a second detector D_2 and an audio-frequency stage NF, and additionally a special generator designated in the figure by O. Various harmonics can be filtered out of the generator O by means of a variable filter device S_1 known as such and said harmonics are applied to the high-frequency receiving circuit. Since these harmonics can be considered as frequency standards they are utilized for calibrating the apparatus. The present invention now resides in the fact that the oscillator having the stable frequency is utilized for two purposes, on the one hand for supplying the harmonics serving for the calibrating, as shown above, and on the other hand, as a second local oscillator to make audible reception possible. To this end another harmonic of the oscillator is filtered out at the same time by means of a filter arrangement S_2 and applied to the second detector D_2. For example if the shortest receiving wave of the apparatus is 200 meters and if through heterodyning an intermediate frequency wave of 160 meters is obtained, there is applied to the detector D_2 a harmonic of the oscillator whose wave is likewise 160 meters. Now when slightly detuning the local oscillator the intermediate frequency ZF changes thereby and the desirable audible note is obtained. As can be seen the arrangement according to the present invention renders a special second local oscillator superfluous. The arrangement may also be employed for controlling the sensitivity in that at known intensity of the harmonic supplied by the oscillator O and applied across the filter S_1 to the high frequency circuit HF, the output intensity is checked-up. To this end it is desirable that the various harmonics which are applied in succession to the high-frequency circuit have the same amplitude. In order to accomplish this, a capacity-resistance circuit 3—4 is employed which brings the various harmonics to approximately the same amplitude. The amplitude curve for the various harmonics has an approximately exponential characteristic. Now in order to bring the harmonics utilized for calibrating and the control of the sensitivity to approximately the same amplitude, the frequency mixture is passed through a capacity resistance filter whose admission curve is reciprocal. In the arrangement herein shown the wave lengths may be chosen for instance as follows: The fundamental oscillations of the quartz crystal be 4800 meters, then the harmonics are in the range from 200 to 4000 meters. The shortest high frequency wave be 200 meters, while 160 meters be the intermediate frequency and 160 meters that of the harmonics of the oscillator which is utilized as second local oscillator wave. A suitable circuit for the oscillator whose fundamental oscillation is determined by the quartz crystal Q is shown in Figure 2. At a correspondingly high resistance of the oscillation circuit and with a fixed feedback, a plate current pattern can be obtained which contains a great deal of upper harmonics. Thus for example the 150th harmonic could be ascertained in an unobjectionable manner. In Figure 2 the oscillator tube is shown at 1, the output from tube 1 being fed through two condensers 2 and 3 to the two circuits noted in Figure 1. The harmonics generated by the tube 1 are fed to the high frequency stage HF through a capacity-resistance circuit 3, 4 which is adapted to act upon the frequencies so that the amplitude of each is substantially the same as noted above. Feedback in tube 1 is provided by means of the tank circuit made up of coils 9 and 12 in series with a variable condenser 14 and a fixed condenser 15. In addition, a condenser 13 is shunted across the two series coils. A switch 7 is provided for short circuiting coil 12. The crystal Q is connected in the grid circuit to which the coils 9 and 12 are coupled through the intermediary of grid coils 10 and 11 respectively. A switch 8 is provided for short circuiting coil 11 and crystal Q. The usual leak resistor 16 is provided between the first grid and cathode of tube 1. The purpose of the switches 7 and 8 is to make use of the oscillator 1 as an ordinary self-controlled oscillator; that is, upon closure of switches 7 and 8 the crystal control is elim-

inated and the frequency is determined in part by variable condenser 14. This provides an arrangement for changing the tone when the oscillator O is used in the ordinary manner.

What we claim is:

1. In a radio receiver of the type which is calibrated so as to indicate the frequency of energy being received and which includes a local oscillator for converting the received frequency to a predetermined intermediate frequency and a second detector to which the resulting intermediate frequency energy is fed, a crystal controlled oscillator for producing a frequency which is harmonically related to said intermediate frequency and a plurality of harmonics of said frequency, connections between said crystal controlled oscillator and said second detector for impressing one of the frequencies generated by said crystal controlled oscillator upon said second detector for providing beat note reception, and connections between said crystal controlled oscillator and the input of the receiver for supplying a wide range of harmonics from said last named oscillator to the receiver input, said last named harmonics serving as a series of accurately known frequencies for calibrating the receiver.

2. The arrangement described in claim 1 wherein said last named connection includes means for rendering the magnitude of all of said harmonics substantially the same.

3. In a radio receiver of the type which is calibrated to indicate the frequency of energy received and which includes a local oscillator for converting the received frequency to a predetermined intermediate frequency and a second detector to which the intermediate frequency energy is fed, a crystal controlled oscillator for producing a plurality of frequencies harmonically related to said intermediate frequency, a filter circuit coupling said crystal controlled oscillator to said second detector for impressing the harmonic generated by said crystal controlled oscillator corresponding to said intermediate frequency upon said second detector for providing beat note reception, and connecting means between said crystal controlled oscillator and the input of the receiver for supplying a plurality of harmonics corresponding to received frequencies from said last named oscillator to the receiver input, said last named harmonics serving as a series of accurately known frequencies for calibrating the receiver.

4. The arrangement described in claim 3 wherein said last named connecting means includes means for rendering the magnitude of all of said harmonics substantially the same.

5. In a radio receiver which is calibrated in terms of frequency being received and which includes a local oscillator for converting the received frequency to a predetermined intermediate frequency and a second detector to which the intermediate frequency is fed, a crystal controlled oscillator for producing a plurality of frequencies harmonically related to said intermediate frequency, connections between said crystal controlled oscillator and said second detector for impressing one of the generated frequencies upon said second detector for providing beat note reception, and a capacity resistance circuit for connecting said crystal controlled oscillator to the input of the receiver for supplying a plurality of harmonics corresponding to received frequencies from said last named oscillator to the receiver input, said last named harmonics serving as a series of accurately known frequencies for calibrating the receiver.

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