

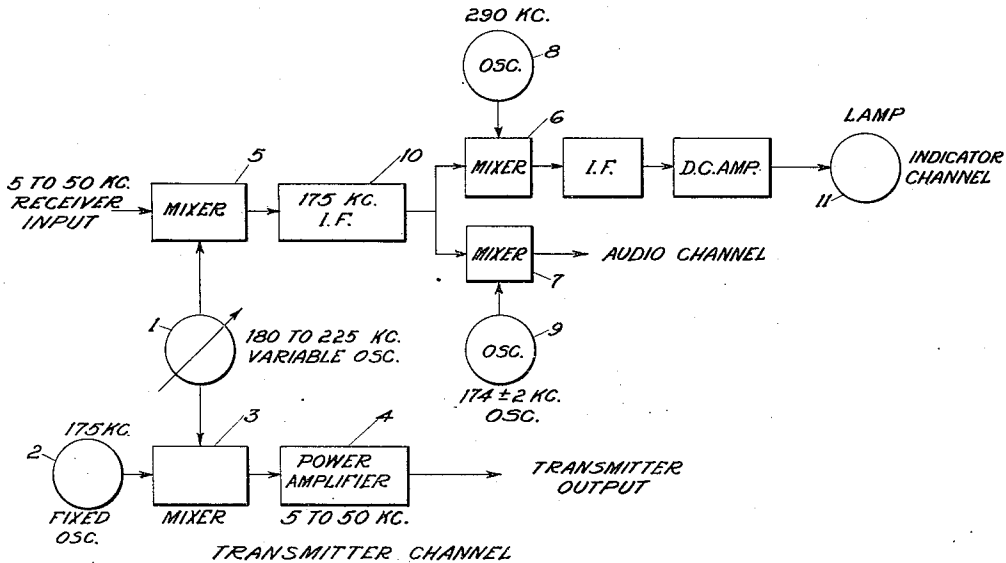
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FREQUENCY VARIATION SYSTEM FOR ECHO RANGING

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FREQUENCY VARIATION SYSTEM FOR
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This invention relates to a uni-control system embodying a single control means for simultaneously tuning a transmitter and a receiver over a pre-determined range of frequencies. The invention finds a particularly useful application in echo-ranging systems which employ a transmitter to send a signal, the echo of which is received by a receiver forming a part of the unit. In such systems it is highly desirable that the receiver be kept tuned to the transmitter at all times and that the tuning means be as simple and fool-proof as possible.

It is an object of this invention to provide a single tuning means which will simultaneously govern the tuning of both the transmitter and receiver.

It is a further object of the invention to provide a means for electrically interlocking the frequencies of the transmitter and receiver in such a manner that a change in the frequency of the transmitter will be automatically accompanied by an equal and corresponding change in the frequency of the receiver.

Referring now to the drawings, the single figure shows a block diagram of an echo-ranging system embodying this invention.

The complete echo-ranging system comprises a transmitter and a receiver-amplifier, the latter amplifying the received signal and sending it through a pair of channels one of which terminates in a visual indicating and timing device and the other of which terminates in means for audibly reproducing the received signal.

The essential feature of the uni-control system is a single variable oscillator 1 having two output channels. Through one of these channels the output of the variable oscillator is mixed with the output of a fixed oscillator 2 to produce a difference frequency in the desired supersonic range for transmitting purposes. Through the other of these channels which goes to the receiver the output of the variable oscillator 1 is mixed with the incoming signal to produce a difference frequency which is the intermediate frequency of the superheterodyne type receiver amplifier.

For purposes of illustration the variable oscillator 1 is shown in the drawing as having a range of from 180 to 225 kilocycles and the fixed oscillator 2 as having a frequency of 175 kilocycles. In the transmitter channel the output of the variable oscillator and the fixed oscillator 2 are mixed in the mixer 3, the output of which will have a frequency within the range of 5 to 50 kilocycles depending upon the setting of the variable

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oscillator 1. This output is then amplified in the power amplifier 4 and is so transmitted. In the receiver channel the output of the variable oscillator 1 is mixed in mixer 5 with the receiver input, which, being a reflected signal from the transmitter, will have a frequency of from 5 to 50 kilocycles. The difference frequency constituting the output of this mixture will remain constantly at a frequency of 175 kilocycles regardless of the setting of the variable oscillator 1. For example, if the variable oscillator 1 is set to give an output of 185 kilocycles the difference frequency constituting the output of mixer 3 will have a frequency of 10 kilocycles. This when received in the mixer 5 and mixed with the output of the variable oscillator 1 will produce a difference frequency of 175 kilocycles. By assuming other settings for the variable oscillator within the range given, it will be found that for each setting the output frequency of mixer 5 will remain at 175 kilocycles. Thus the transmitting and receiving frequencies are always electrically interlocked so that the transmitter and receiver are necessarily tuned to the same frequency. By the proper selection of the oscillator frequencies a relatively small percentage change of the variable oscillator 1 will tune both transmitter and receiver over the entire supersonic frequency band.

The output of the mixer 5 becomes the intermediate frequency of the receiver which is amplified in amplifier 10, and this frequency is then mixed through separate mixers 6 and 7 with the output of two oscillators 8 and 9 and sent through separate channels, the output of the mixer 6 going to the indicator lamp 11 and that of the mixer 7 through the audio channel to ear phones or other means for audibly reproducing the signal.

While the disclosure of the invention has been limited to one embodiment, it is to be understood that the scope of the invention is not limited thereby.

The invention described herein may be manufactured and/or used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

We claim:

1. A method for controlling the frequency of a transmitter and receiver for sending and receiving an echo-ranging signal at one of a pre-determined range of frequencies comprising the steps of producing fixed-frequency oscillations, producing adjustable frequency oscillations, and

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maintaining said adjustable frequency oscillations at one desired frequency for transmission and reception of a given echo-ranging signal by mixing the adjustable frequency oscillations with the fixed frequency oscillations for transmission of the signal and heterodyning the adjustable frequency oscillations with the signal resulting from the mixing of the adjustable frequency oscillations and the fixed-frequency oscillations simultaneously for reception of the transmitted signals.

2. A supersonic echo ranging system having a constantly operable transmitter and receiver, said system comprising a continuously variable tuning oscillator adjustable to one desired frequency, a fixed oscillator, mixer means responsive to the tuning and fixed oscillators, transmitter means operative to transmit the mixer output, a hetero-

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dyne receiver comprising a first input mixer stage, means feeding the tuning oscillator signal to the mixer stage, and an intermediate frequency amplifier tuned to the fixed oscillator frequency.

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