

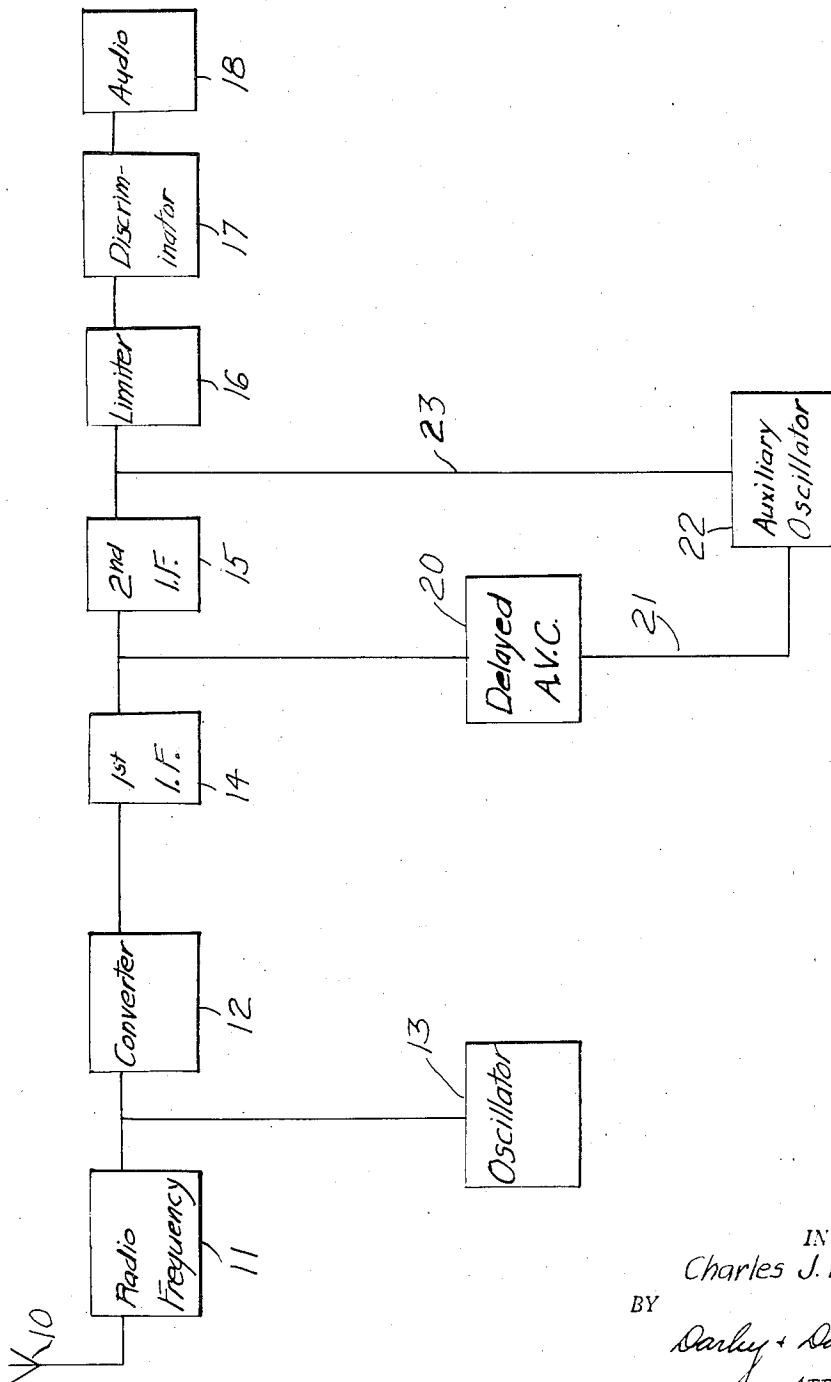
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NOISE REDUCING RADIO RECEIVER

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UNITED STATES PATENT OFFICE

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NOISE REDUCING RADIO RECEIVER

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1 Claim. (Cl. 250—20)

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The present invention relates to noise limiters and especially to a means of reducing noise between transmitting stations during tuning of a frequency modulation receiver.

More particularly still the invention relates to the use of an auxiliary oscillator operating at a frequency which will not interfere with the intermediate frequency of the receiver and which will apply a signal to the limiter stage of the receiver to reduce noise when tuning from one station to another.

It is an object of this invention to provide a noise limiter for frequency modulation signal reception which will materially reduce the noise when the set is tuned from one transmitter to another.

It is another object of this invention to produce such a noise limiter which will require no adjustment on the part of the operator and which will be economical to produce.

Other objects and features of my invention will be apparent when the following description is considered in connection with the annexed drawing, in which—

The single figure is a block diagram of a frequency modulation receiver having the auxiliary oscillator of my invention applied thereto.

Referring now to the drawing, there is shown at 10 the receiving antenna of a frequency modulation receiver, the antenna being connected in the usual manner to the radio frequency amplification stages 11. From these stages the signals are applied to the converter 12 in which there is also present a signal from the oscillator 13 so that the signal output from the converter is at the proper frequency for amplification in the first intermediate frequency amplifier stage 14. The signals are then passed through the second intermediate frequency amplifier stage 15 and through limiter 16 and discriminator 17 to the audio frequency amplification stages 18, the output of which, in the usual manner, is applied to a loud speaker or other translating device.

In accordance with my present invention I provide a delayed automatic volume control circuit 20, the input to which may be derived from the output of the first intermediate frequency amplifier 14. This delayed automatic volume control circuit is coupled by means of the lead 21 to an auxiliary oscillator 22, the output of which is supplied over a lead 23 to the limiter 16.

The auxiliary oscillator 22 is adjusted to produce a signal at a frequency which will not interfere with the intermediate frequency. For ex-

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ample, if the intermediate frequency is 4.3 megacycles the auxiliary oscillator may be at 5.1 megacycles. The auxiliary oscillator is adjusted to produce a signal of sufficient amplitude to operate the limiter; for example, if the limiter threshold voltage is 4 volts, the oscillator circuit constants may be such as to make its output somewhat greater than 4 volts; for example, a 7 volt output was found to be satisfactory for use with such a limiter. The amplitude of the received signal, as applied to the limiter, is preferably of the order of 1.75 times the amplitude of the 5.1 megacycles signal from the auxiliary oscillator 22 in order to minimize beat note distortion.

It will be clear, however, that if the signal strength is sufficient to operate the limiter no auxiliary oscillator input is necessary and, in fact, the presence of the auxiliary oscillator voltage effectively increases the necessary signal voltage which must be applied to the limiter for good reception. In the present example the signal voltage would have to be increased from the limiter threshold value to 1.75 times that value.

Thus it is advantageous to provide an automatic volume control system connected to an intermediate frequency stage prior to the injection point of the auxiliary oscillator voltage, since this auxiliary circuit will then supply a bias voltage (when the signal strength is sufficient to operate the limiter) which cuts down the oscillation strength and prevents interference between the desired signal and the auxiliary oscillator output. The oscillator 22 should, of course, be designed to permit control of the amplitude of its output signal in accordance with an automatic volume control voltage. By way of example an oscillator such as that shown in United States Patent No. 2,316,076, issued April 6, 1943, might be employed, the AVC voltage being applied to the No. 1 grid of the oscillator.

It will be clear that the delayed AVC circuit and control may be omitted, although if this is done there will be a possibility of interference between very weak signals and the auxiliary oscillator output.

By means of the present invention a novel circuit arrangement has been provided whereby the annoying interstation noises usually encountered while tuning from station to station may be eliminated without deleteriously affecting the reception of desired stations.

While I have described a preferred embodiment of my invention it is obvious that other embodi-

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ments and constructions may be adopted without departing from the spirit thereof and, consequently, I desire to be limited not by the foregoing description, but solely by the scope of the appended claim.

What is claimed is:

In a frequency modulation receiver of the type comprising a carrier frequency signal transmission circuit, a carrier signal amplitude limiter stage, and a frequency detector stage having a different response band than the limiter stage, the improvement which comprises, in combination, a high frequency signal generator, the generated signal from which is applied, together with the carrier frequency signal from the signal transmission circuit, to the input circuit of said amplitude limiter stage, the frequency of said generated signal lying within the response band of said amplitude limiter stage but without the response band of said frequency detector stage, an automatic volume control circuit coupled to said transmission circuit for developing a control voltage the magnitude of which is dependent upon the amplitude of the carrier signal in said transmission circuit, and means for operatively applying said control voltage to said high frequency

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signal generator in such sense as to lower the output signal thereof as the amplitude of such carrier signal increases.

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