

June 4, 1940.

V. D. LANDON

2,203,465

NOISE REDUCTION SYSTEM

Filed May 28, 1938

3 Sheets-Sheet 1

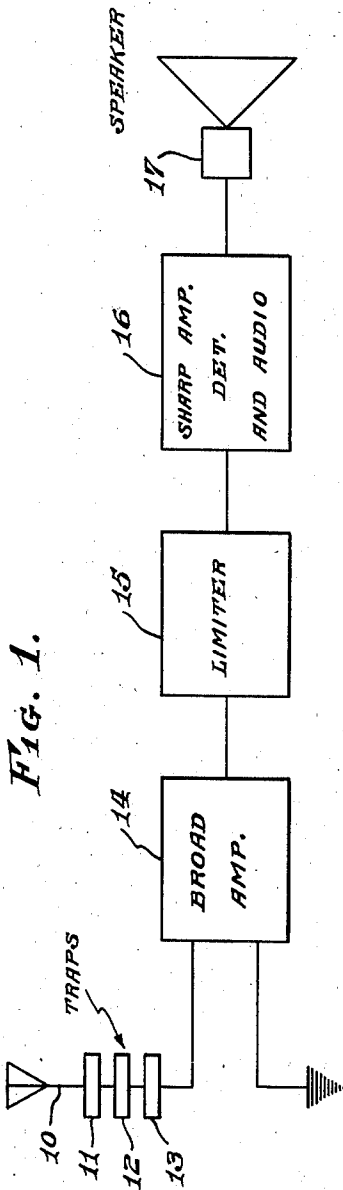


**Fig. 3.**

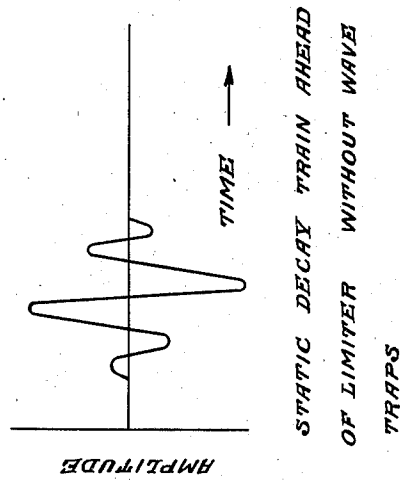
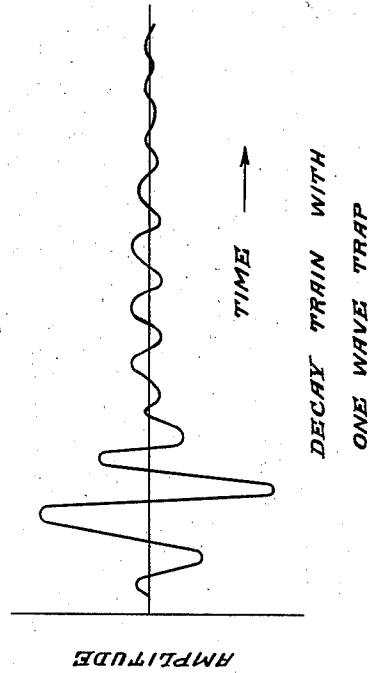


**Fig. 4.**



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**June 4, 1940.**

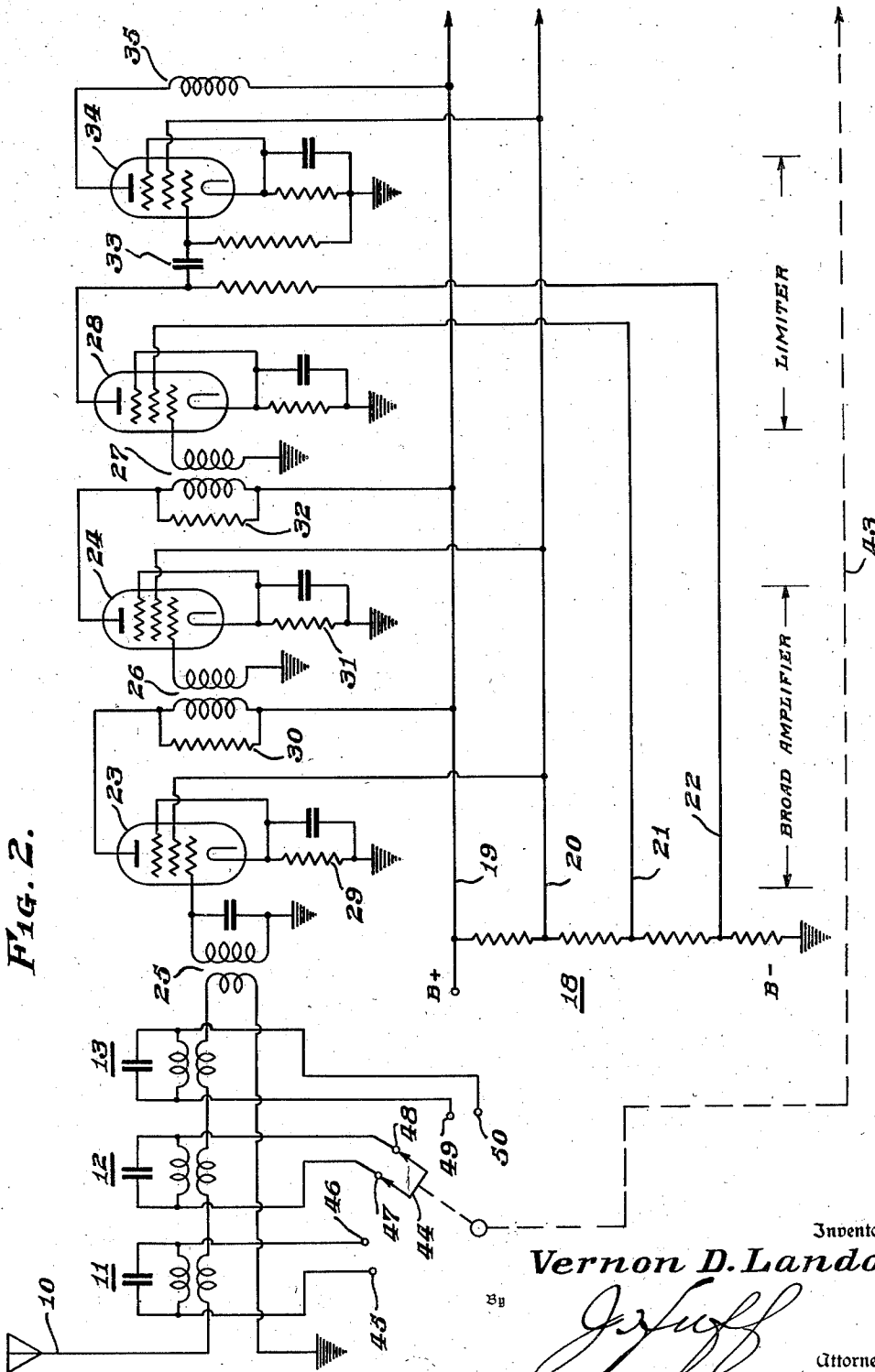
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# NOISE REDUCTION SYSTEM

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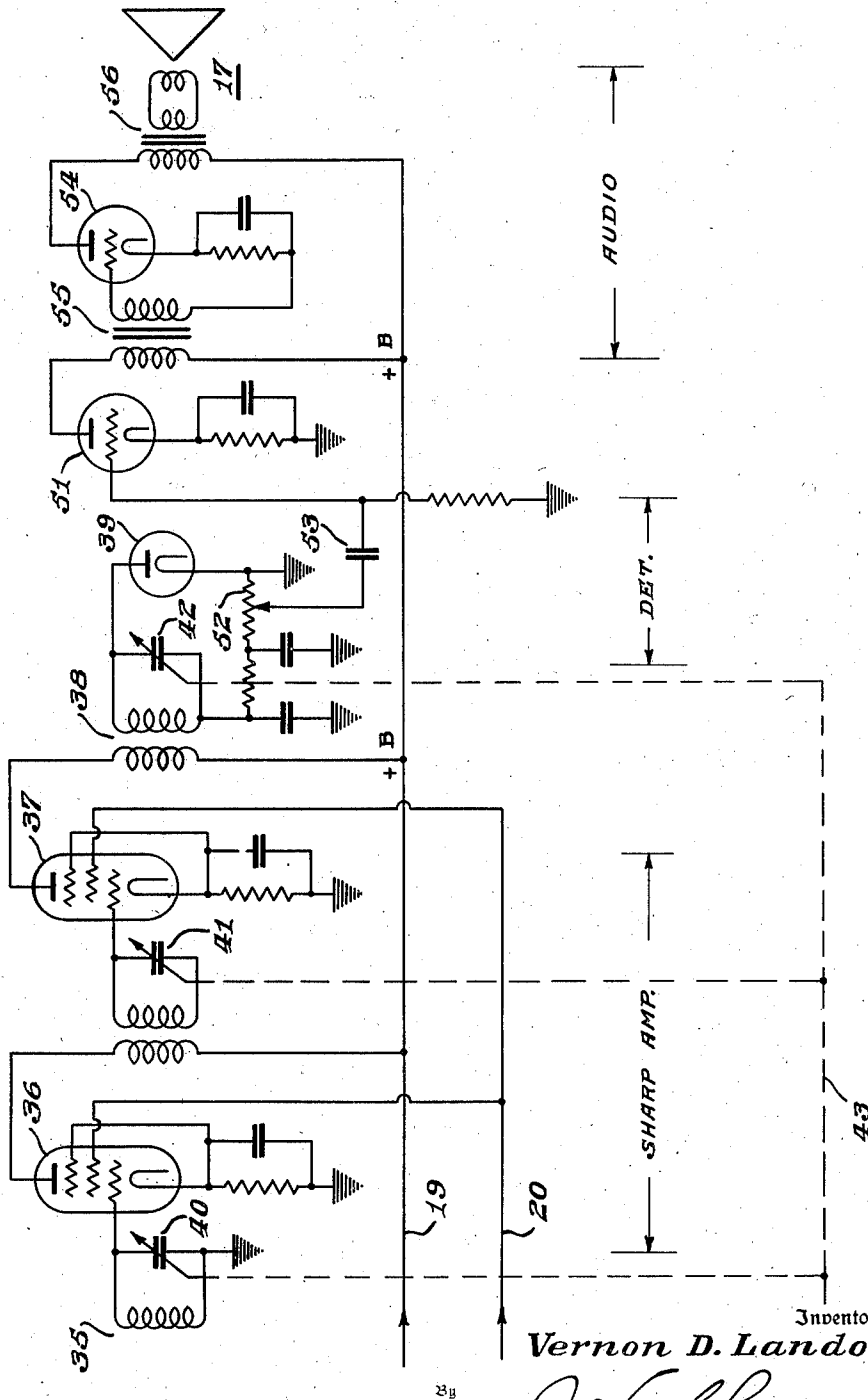
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FIG. 2 A.



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## UNITED STATES PATENT OFFICE

2,203,465

## NOISE REDUCTION SYSTEM

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to Radio Corporation of America, a corpora-  
tion of Delaware

Application May 28, 1938, Serial No. 210,581

5 Claims. (Cl. 250—20)

This invention relates to noise reduction systems such as are utilized to eliminate undesired electrical impulses from the output of radio receiver apparatus and the like, and has for its principal object the provision of an improved system and method of operation whereby the broadcast signals reaching the limiting element of the system are largely restricted to those originating at the station from which reception is desired.

In connection with systems of this character, it is well known that the amplifier stages preceding the limiter should be broadly tuned and that the amplifier stages following the limiter should be sharply tuned if the noise is to be most effectively reduced. In this type of system, however, there is encountered the difficulty that unwanted broadcast signals from adjacent stations in the broadcast band are likely to saturate the limiter and prevent its proper functioning to separate the desired signal from the noise impulses superimposed on it. In accordance with the invention, this difficulty is avoided by the provision of a series of wave traps which are interposed between the antenna and the first amplifier stage and are so ganged or mechanically coupled with the tuning elements of the sharply tuned stages that each unwanted broadcast signal is prevented from reaching the input of the broadly tuned stages. This allows the broadly tuned stages ahead of the limiter to cover the full width of the broadcast band except for the signal ranges excluded by the wave traps.

The invention will be better understood from the following description considered in connection with the accompanying drawings and its scope is indicated by the appended claims.

Referring to the drawings—

Figure 1 is a block diagram illustrating certain features of the invention.

Figures 2 and 2A are wiring diagrams of the system of Fig. 1, and

Figures 3 and 4 are explanatory curves relating to the operation of the invention.

The system of Fig. 1 includes an antenna 10 from which signal impulses are supplied through wave traps 11, 12 and 13, a broadly tuned amplifier 14, a limiter 15, and a sharply tuned amplifier, a detector and an audio amplifier (all generally indicated by a reference numeral 16) to a loudspeaker 17. As will appear in connection with Figs. 2 and 2A, the connections of the wave traps 11, 12 and 13 are so controlled with respect to the tuning elements of the sharply tuned amplifier and detector stages that the limiter is sub-

jected for the most part only to broadcast signals originating at the station to which the sharp stages are tuned.

As appears from Figs. 2 and 2A, which are taken together to show the complete signal channel, the power for operating the various stages is derived from a bleeder resistor 18 provided with a high potential lead 19 and a plurality of intermediate potential leads 20, 21 and 22.

The broadly tuned section of the channel includes two stages 23 and 24. The stage 23 has its input circuit coupled to the antenna 10 through a transformer 25 and its output circuit coupled to the input circuit of the stage 24 through a transformer 26. The output circuit of the stage 24 is coupled through a transformer 27 to the control grid circuit of a limiter 28. As is customary, the stage 23 is provided with the usual condenser shunted cathode lead bias resistor and with a resistor 30 connected in shunt to its output winding for ensuring broad tuning. The stage 24 is similarly provided with a cathode lead resistor 31 and an output coil shunt resistor 32.

It is also desirable that the broadly tuned section of the channel be provided with an automatic volume control circuit for keeping the peak voltage of all the continuous wave voltages added together to such a value as to barely fill the limiter. How such a circuit is applied to the broadly tuned section of the channel is so well known as to render its illustration unnecessary.

It should be noted that screen grid voltage is applied to the broadly tuned amplifiers 23 and 24 and the tubes 34, 36 and 37 through the intermediate potential lead 20, and that the anode and screen grid voltages of the limiter 28 are derived respectively through the leads 22 and 21. Under these conditions, the amplitude of the electrical impulses passing through the limiter 28 is restricted to a value predetermined by saturation of the limiter which is operated at a relatively low cathode-anode voltage.

Coupled to the output circuit of the limiter 28 through a resistance coupling including the capacitor 33 is a relatively low impedance stage 34 which has its output circuit coupled through a transformer 35 (transfer from Fig. 2 to Fig. 2A) to the input of sharply tuned stages 36 and 37. The output circuit of the sharply tuned amplifier 37 is coupled through a transformer 38 to a diode detector 39.

It should be observed that the amplifiers 36 and 37 and the detector 39 are provided, respectively, with input circuit tuning capacitors 40, 41

and 42 and that these tuning capacitors are ganged or mechanically coupled through a unitary control member, indicated by the broken line 43, to a switch member 44 arranged to engage one after the other of the contacts 45-46, 47-48 and 49-50 of the wave traps 11, 12 and 13. As previously indicated, the switch member 44 and the tuning capacitors 40, 41 and 42 are so correlated mechanically that the wave trap tuned to the desired station is rendered inoperative.

The remainder of the signal channel requires little explanation. It includes an audio frequency stage 51 which derives its control grid potential from the diode output resistor 52 through a coupling capacitor 53 and a second audio frequency stage 54 provided with an input circuit coupled to the output circuit of the stage 51 through a transformer 55 and with an output circuit coupled to the loudspeaker through a transformer 56.

As indicated by Fig. 3, a decoy train due to a static pulse is of short duration in a broad amplifier. The sharp wave trap puts a long "tail" on the wave train. Due to the fact that this "tail" is of a frequency to which the trap is tuned, it is not heard in the receiver which is tuned to a different frequency. The "tail" (see Fig. 4) has a long time duration but a low amplitude and hence does not actuate the limiter. The high amplitude and short time duration portion of the wave train is limited by saturation of the limiter 28 or in any other suitable manner and produces little or no effect on the output after passing through the sharp amplifier stages 51 and 54.

I claim as my invention:

1. In a noise reduction system wherein a limiter is interposed between a broadly tuned signal section and a sharply tuned signal section followed by a detector, the combination of a plurality of wave traps connected ahead of said broadly tuned section for selectively controlling the frequency of the broadcast signals transmitted to said limiter, and unicontrol means for maintaining a predetermined relation between the selection of said wave traps and the tuning of said sharply tuned section.

2. In a noise reduction system wherein a limiter is interposed between a broadly tuned signal section and a sharply tuned signal section fol-

lower by a detector, the combination of a plurality of wave traps connected ahead of said broadly tuned section for selectively controlling the frequency of the broadcast signals transmitted to said limiter, and unicontrol means for maintaining a predetermined relation between the selection of said wave traps and the tuning of said sharply tuned section and said detector.

3. In a noise reduction system, a signal amplifying channel comprising, in combination, a broadly tuned signal section followed by a sharply tuned signal section, signal limiter means interposed between said sections, means for tuning said second named section to a predetermined signal frequency, and means external of said broadly tuned section for minimizing in said broadly tuned section signals at frequencies other than said predetermined signal frequency.

4. In a noise reduction system, a signal amplifying channel comprising, in combination, a broadly tuned signal section followed by a sharply tuned signal section, signal limiter means interposed between said sections, means for tuning said second named section to a predetermined signal, means for minimizing in said broadly tuned section signals other than said predetermined signal, and means for simultaneously and conjointly actuating said last named means and said means for tuning said second named section in predetermined relation to each other.

5. In a noise reduction system wherein a limiter is interposed between a broadly tuned signal section and a sharply tuned signal section followed by a detector whereby received signals pass through said broadly tuned signal section to the limiter and thence through the sharply tuned signal section to the detector in the order named, the combination of a plurality of wave traps connected ahead of said broadly tuned section for selectively controlling the frequency of the broadcast signals transmitted to said limiter, means for variably tuning said sharply tuned signal section through a predetermined signal selecting range, and unicontrol means for maintaining a predetermined relation between the selection of said wave traps and the tuning of said sharply tuned section and said detector by said last named means.

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