

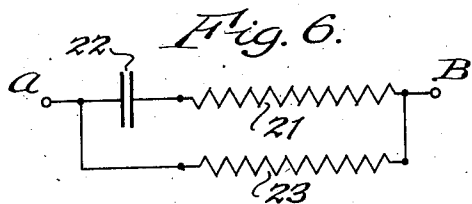
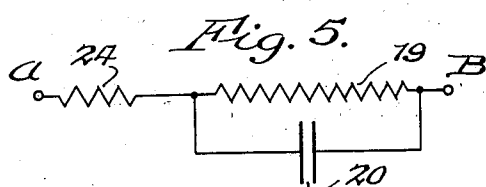
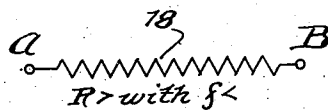
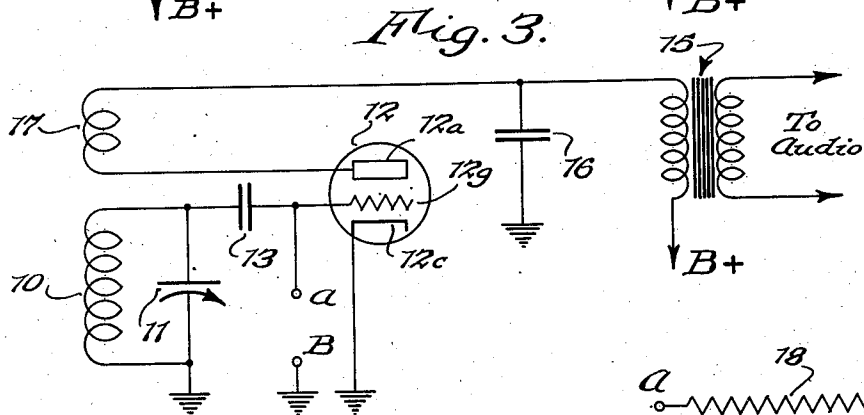
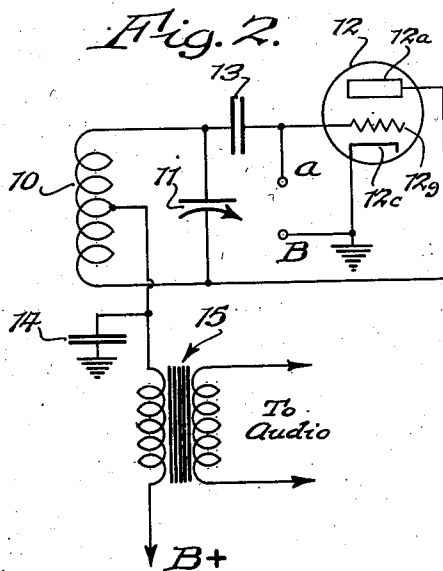
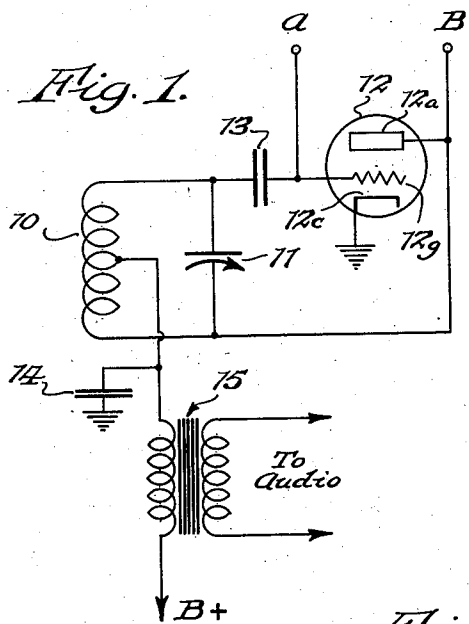
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E. E. BIRR

2,407,394

SELF-QUENCHED SUPERREGENERATIVE RECEIVER

Filed June 29, 1944



INVENTOR.

Edmund E. Birr

BY

C. A. Norton  
ATTORNEY

## UNITED STATES PATENT OFFICE

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## SELF-QUENCHED SUPERREGENERATIVE RECEIVER

Edmund E. Birr, Kenmore, N. Y., assignor to  
Colonial Radio Corporation, Buffalo, N. Y.

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5 Claims. (Cl. 250—20)

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This invention relates to superregenerative receivers, and more particularly to superregenerative receivers of the self-quenched type.

In the past, considerable difficulty has been encountered in self-quenched superregenerative receivers due to interference between higher harmonics of the quenching frequency and the signal to be received. This effect may limit the low frequency range of such receivers when a high order of sensitivity is desired.

The interference can occasionally be overcome by a selection of quench frequency such that the strongest harmonics of the quench frequency are outside the tuning range, but this method is frequently unsatisfactory if the receiver is required to cover a wide range of frequencies.

Also, in quantity production of such receivers the effect is likely to be different from receiver to receiver, making it necessary to change the quench frequency in each individual case.

It is frequently found also that there is no possible adjustment of quench frequency which will eliminate the trouble, even when the quenching frequency is lowered so far that the audio response limit of the receiver is approached.

In accordance with my invention, I have found that this difficulty can be eliminated by the use of a special resistor or resistance capacity network in the receiver circuit, as will be more particularly explained hereafter.

It is an object of my invention to provide a superregenerative receiver of the self-quenched type which is not subject to the interference and undesired effects above mentioned.

It is a further object of my invention to eliminate the above mentioned interference and undesired effects without impairing the sensitivity of the receiver.

It is a further object of my invention to eliminate the said interference and undesired effects without impairing the selectivity of the receiver.

Still other objects and advantages of my invention will be apparent from the specification.

The features of novelty which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its fundamental principles and as to its particular embodiments, will best be understood by reference to the specification and accompanying drawing, in which

Fig. 1 shows one form of my invention as applied to a self-quenched, superregenerative receiver.

Fig. 2 shows another way of applying my invention to the same receiver.

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Fig. 3 shows my invention applied to a receiver utilizing a different type of feed-back circuit.

Fig. 4 indicates a resistance of the type employed in my invention.

Figs. 5 and 6 illustrate alternate forms of resistance capacity networks which may be employed with my invention.

In the various figures like reference characters indicate like parts.

Referring now more particularly to Fig. 1, I have indicated a superregenerative receiver of the self-quenched type employing a tuned circuit consisting of inductance 10 and variable condenser 11. The detector and oscillator tube is indicated as 12, and may comprise cathode 12c, control grid 12g, and anode 12a.

Control grid 12g may be connected through condenser 13 to one terminal of tuning condenser 11, cathode 12c may be connected to ground, and anode 12a may be connected to the opposite terminal of condenser 11. A midpoint or a suitable intermediate point of the inductance 10 may be connected through the primary of audio transformer 15 to the +B supply and through by-pass condenser 14 to ground.

The circuit will be recognized as an oscillator of the well-known Hartley type, and when operated with a suitable resistance between terminals A and B respectively connected to the grid 12g and to anode 12a, and when the resistance and the value of condenser 13 are properly chosen, the circuit will operate as a self-quenched, superregenerative receiver and will operate as a detector for incoming signals, which may be supplied to the tuned circuit 10 and 11 through any suitable means (not shown).

As already stated, such a receiver is subject to interference between harmonics of the quench frequency and the incoming signal. I have discovered that this difficulty can be eliminated if the resistance which is connected between the terminals A and B has a characteristic such that its resistance is relatively high at the quench frequency and relatively low at the desired signal frequency.

Certain resistances on the market have such a characteristic, which is ordinarily regarded as undesirable, and which would ordinarily be regarded as sufficient reason for preventing their use in such circuits. However, I find that such resistances, when employed in a circuit of this type, eliminate the interference and other undesired effects quite remarkably. In Fig. 4 I have indicated resistance 18 as of this type, in which the

value of the resistance decreases as frequency increases.

In Fig. 5 I have shown an alternative form consisting of resistances 19 and 24 in series, which, in this instance, may have a substantially flat frequency characteristic, and resistance 19 may be shunted by a condenser 20, which offers a high impedance at quench frequencies and relatively low impedance at desired signal frequencies.

In Fig. 6 I have indicated still another alternative form, this being a network consisting of resistances 21 and condenser 22 in series, both shunted by resistance 23. In this instance both resistances 21 and 23 may have a fairly flat frequency characteristic, and the entire network is so chosen that the impedance at quench frequencies is relatively high, and at desired signal frequencies is relatively low. Any one of the circuits indicated in Figs. 4, 5, and 6 may be connected between points A and B of Fig. 1, 2, or 3.

Referring now more particularly to Fig. 2, this shows the same circuit as in Fig. 1, but in the present instance the network terminals A and B are connected between grid and cathode instead of between grid and anode. The operation of the circuit is essentially the same.

Referring now more particularly to Fig. 3, there is shown a conventional type of feed-back circuit consisting as before of inductance 10 and condenser 11, detector tube 12, having a cathode 12c, control grid 12g, and anode 12a, and in this instance employing a feed-back coil 17 inductively related to the inductance 10 and connected to the anode 12a and to the anode side of the audio-frequency transformer 15, which in turn is connected to the +B supply, the transformer 15 being shunted in this case by by-pass condenser 16.

In this instance the resistance capacity network may be connected between grid 12g and ground, and the operation of this circuit in respect of superregeneration, self-quenching, and the elimination of the above mentioned interference and other undesired effects, is the same as before.

While the exact operation of such circuits is not completely understood in respect to theory, and while I do not, therefore, wish to be bound by any particular theory as to why my invention operates as it does, I believe that the lower value of the resistance at desired signal frequencies lowers the Q of the input circuit to some extent and that this lowering of the Q reduces the amplitude of the higher frequency harmonics of the quench frequency to such an extent that the trouble is greatly reduced or even entirely eliminated. At the same time, the sensitivity and selectivity of the receiver is not measurably impaired. At any rate, whether this theory be correct or not, there is no doubt as to the facts.

For the purpose of completing the disclosure herein, and not by way of limitation, the following values are given: resistance 18 is approximately 1 megohm D. C. at quench frequencies and approximately 100,000 ohms at incoming signal frequency; resistance 24, 90,000 to 100,000 ohms; resistance 19, approximately 900,000 ohms; condenser 20, 10 mmf.; resistance 21, 90,000 to 100,000 ohms; resistance 23, 1 megohm; and condenser 22, 10 mmf.

While I have shown and described certain preferred embodiments of my invention, it will be understood that modifications and changes may be made without departing from the spirit and scope thereof, as will be clear to those skilled in the art.

In this application I have particularly pointed out and distinctly claimed the part, improvement, or combination which I claim as my invention or discovery, and I have explained the principles thereof and the best mode in which I have contemplated applying those principles so as to distinguish my invention from other inventions.

I claim:

1. In a superregenerative receiver of the self-quenching type, in combination, a tuned circuit, a thermionic vacuum tube connected thereto having an anode, a cathode, and a control electrode, and a resistance connected between the control electrode and one of the other electrodes of said tube, said resistance having a relatively high value at quench frequencies and a relatively low value at desired signal frequencies.
2. In a superregenerative receiver of the self-quenching type, in combination, a tuned circuit, a thermionic vacuum tube connected thereto, having an anode, a cathode, and a control electrode, and a resistance connected between the control electrode and one of the other electrodes of said tube, said resistance having a relatively high value at quench frequencies and its resistance decreasing at a substantial rate with frequency increase.
3. In a superregenerative receiver of the self-quenching type, in combination, a tuned circuit, a thermionic vacuum tube connected thereto, said tube having a cathode, an anode, and a control electrode, and a resistance-capacity network connected between said control electrode and one of the other electrodes of said tube, said network having a high impedance at quench frequencies and a relatively low impedance at desired signal frequencies.
4. In a superregenerative receiver of the self-quenching type, in combination, a tuned circuit, a thermionic vacuum tube connected thereto, said tube having a cathode, an anode, and a control electrode, and a resistance-capacity network connected between said control electrode and one of the other electrodes of said tube, said network comprising a resistance and capacity in parallel and a resistance in series therewith and having a high impedance at quench frequencies and a low impedance at desired signal frequencies.
5. In a superregenerative receiver of the self-quenching type, in combination, a tuned circuit, a thermionic vacuum tube connected thereto, said tube having a cathode, an anode, and a control electrode, and a resistance-capacity network connected between said control electrode and one of the other electrodes of said tube, said network comprising a resistance and capacity in series shunted by a resistance, said network having a high impedance at quench frequencies and a relatively low impedance at desired signal frequencies.

EDMUND E. BIRR.