

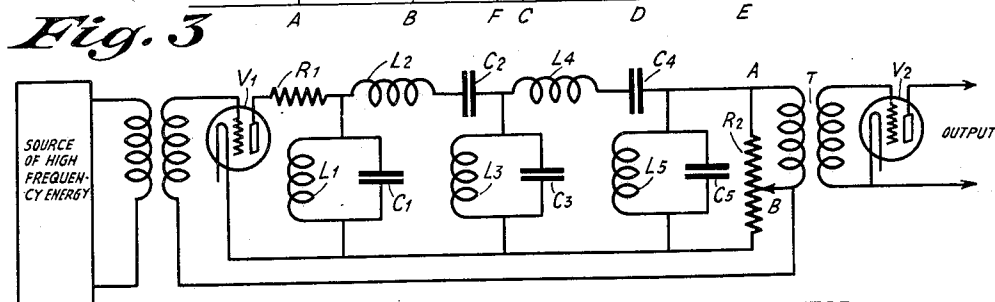
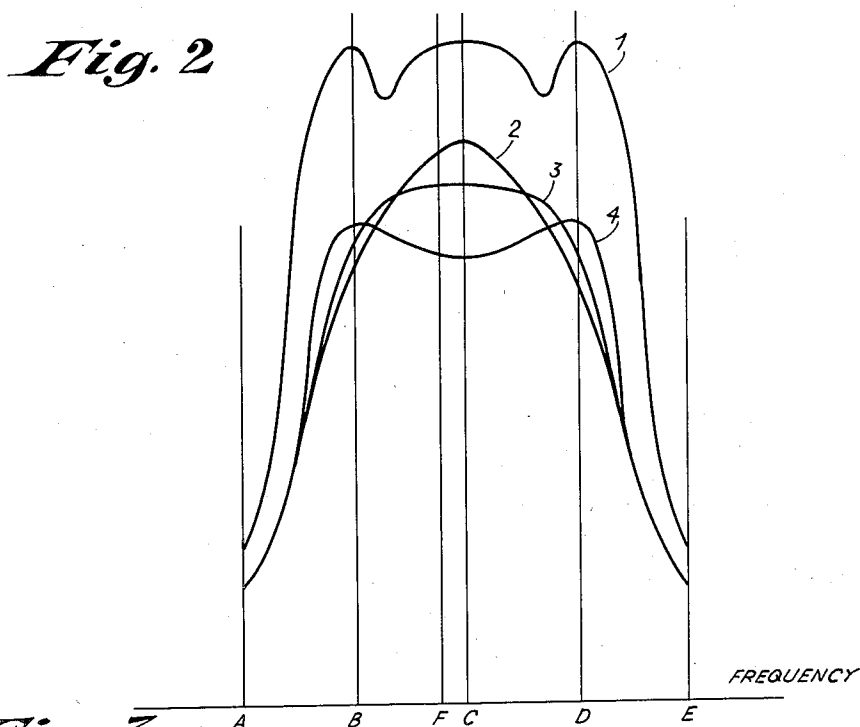
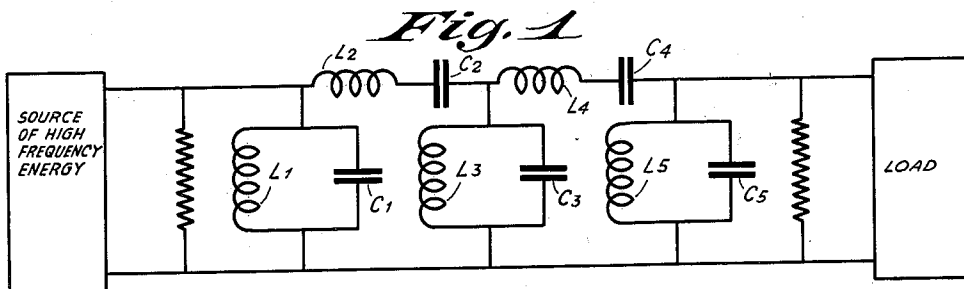
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T. J. WEYERS

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BAND PASS CIRCUIT

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INVENTOR
THEODORUS J. WEYERS

BY *W. S. Brown*
ATTORNEY

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BAND PASS CIRCUIT

Theodorus Josephus Weyers, Eindhoven, Netherlands, assignor to Radio Corporation of America, a corporation of Delaware

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6 Claims. (Cl. 178-44)

The present invention relates to installations in which use is made of filters, as for example, in line telephony (low and high frequency), receiving installations for wireless telephony, television, or the like.

The filter serves to obtain a uniform amplification of a determined band of frequencies, whereas the frequencies lying outside this band are substantially not amplified. For this purpose use is made of filters consisting of a combination of one or more self-inductances and capacities. Fig. 1 of the drawing represents, by way of example, one embodiment, in which the filter consists of the circuits $L_1 C_1$, $L_2 C_2$, $L_3 C_3$, $L_4 C_4$, $L_5 C_5$. Such a filter has five resonance frequencies. When neglecting the damping due to the dissipation in the filter elements, the characteristic curve of this filter may be represented by the curve 1 of Fig. 2 in which the resonance frequencies are denoted by A, B, C, D and E. The difference between these frequencies, and therefore the width of the frequency band passed on by the filter, is determined by the ratio of L and C in each of the circuits. Due to the dissipation in the filter elements there are produced in the characteristic curve deviations which for the side frequencies are greater than for the middle frequencies so that a characteristic curve is obtained which has the shape of the curve 2 in Fig. 2.

The present invention has for its object to give this curve a shape which comes nearer to the ideal shape. Use is made for this purpose of the fact that the phase of the energy in the output circuit relative to that in the input circuit depends on the frequency. According to the invention, coupling back to the input side takes place from a point of the filter which is so chosen that for the mean proportional between the limit frequencies of the frequency band to be passed on, the energy coupled back is in counterphase with the energy directly supplied.

For the explanation thereof reference may be made to Fig. 2. If for the frequency C the phase in the output circuit is equal to that in the input circuit, the phase displacement for D will be 180° ; for E it will be 360° , and for an infinitely high frequency it would be 450° . The phase displacement for the frequency B is 180° ; for a frequency A it will be 360° ; and for a frequency 0 it will be 450° . When coupling back negatively, i. e., with a phase displacement of 180° , from the output impedance this implies for the frequency C a decrease of the amplification, for the frequencies B and D an increase of the amplification, and for A and E again a decrease. As a

result there is consequently obtained a flattening of the characteristic curve for the frequencies to be transmitted while the sides of the curve become steeper and the frequencies A and E are less amplified. The curve 3 in Fig. 2 represents the characteristic curve of the filter with retroaction. By coupling back still stronger there is obtained the curve 4.

The desired feed back action may be obtained with a circuit arrangement as shown in Fig. 3 which comprises a resistance R_1 , a filter composed of units $L_1 C_1$, $L_2 C_2$, $L_3 C_3$, $L_4 C_4$, $L_5 C_5$, and a resistance R_2 included in the output circuit of an amplifier tube V_1 . The resistances R_1 and R_2 are so chosen that the value of the resistance R_2 , and also the total amount of the value of the resistance R_1 , and the internal resistance of the amplifier V_1 are equal to the wave resistance of the filter. A suitably chosen point of the resistance R_2 is connected to the input circuit in order to obtain the required retroaction. The amplified energy is preferably taken between the points A and B of the resistance R_2 , consequently from that portion of the output impedance which is not coupled back, said energy being supplied through a transformer T to the input electrodes of a tube V_2 .

If, for example due to parasitic capacities, the filter is not perfectly symmetrical so that not the phase displacement of the point C but, for example, that of the point F would be equal to zero, the resistance R_2 is replaced by an impedance causing such a phase displacement that by coupling back the above described required effect is obtained again. For this purpose a capacitive, or inductive, impedance may be connected in series, or in parallel, with R_2 , or with part of R_2 . It will be evident that the invention is neither restricted to a filter of the above described type nor to the use of a filter consisting of five tuned circuits. Use may be made of a filter of arbitrary construction, if only care is taken to provide the retroaction in such manner that the frequency band to be passed on is amplified more linearly, and that the frequencies lying outside this band are less amplified. If use is made of a filter consisting of a large number of elements it is advantageous, instead of coupling back over the whole filter, to couple back over part thereof owing to which the number of amplifications or attenuations is reduced.

While I have indicated and described one arrangement for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the par-

ticular organization shown and described, but that many modifications may be made without departing from the scope of my invention as set forth in the appended claims.

What is claimed is:

1. A band filter, adapted to be connected between a source of high frequency energy of a predetermined frequency band width and a load circuit, comprising a plurality of resonant networks, each network being resonant to a different frequency component of said band, and a path connected between a predetermined point in the output side of the filter and the input side for feeding back said energy, said point being so chosen that for the mean proportional between the limiting frequencies of the said band the energy fed back is in phase opposition to the energy impressed on said input side from said source.

2. A band filter, adapted to be connected between a source of high frequency energy of a predetermined frequency band width and a load circuit, comprising at least five resonant networks, each network being resonant to a different frequency component of said band, and a path connected between a predetermined point in the output side of the filter and the input side for feeding back said energy, said point being so chosen that for the mean proportional between the limiting frequencies of the said band the energy fed back is in phase opposition to the energy impressed on said input side from said source.

3. A band filter, adapted to be connected between a source of high frequency energy of a predetermined frequency band width and a load circuit, comprising a plurality of resonant networks, each network being resonant to a different frequency component of said band, and a path connected between a predetermined point in the output side of the filter and the input side for feeding back said energy, said point being so chosen that for the mean proportional between the limiting frequencies of the said band the energy fed back is in phase opposition to the energy impressed on said input side from said source, said filter input including a tube having its input electrodes connected to said path, and an additional tube coupled to the output side of the said filter.

4. A band filter, adapted to be connected between a source of high frequency energy of a predetermined frequency band width and a load circuit, comprising a plurality of resonant networks,

each network being resonant to a different frequency component of said band, and a path connected between a predetermined point in the output side of the filter and the input side for feeding back said energy, said point being so chosen that for the mean proportional between the limiting frequencies of the said band the energy fed back is in phase opposition to the energy impressed on said input side from said source, said output side including a terminating resistor, and said path being adjustably connected across a part of the resistor.

5. The combination with a source of high frequency energy wherein the energy comprises a band of frequencies, an amplifier tube having its input coupled to the source, and a second tube, of a band filter having its input terminals coupled to the output electrodes of the amplifier tube and its output terminals coupled to the input of the second tube, said filter including a plurality of resonant networks, each of the networks being resonant to a different one of said frequencies, and means for feeding back a portion of the energy output of the filter to the amplifier tube input, the energy fed back being in phase opposition with the energy fed to the amplifier input from said source whereby energy of frequencies lying outside said band is substantially not transmitted through the filter while a substantially uniform transmission of the said band frequencies is secured.

6. The combination with a source of high frequency energy wherein the energy comprises a band of frequencies, an amplifier tube having its input coupled to the source and a second tube, of a band filter having its input terminals coupled to the output electrodes of the amplifier tube and its output terminals coupled to the input of the second tube, said filter including a plurality of alternate series and shunt resonant networks, each of the networks being resonant to a different one of said frequencies, and means for feeding back a portion of the energy output of the filter to the amplifier tube input, the energy fed back being in phase opposition with the energy fed to the amplifier input from said source whereby energy of frequencies lying outside said band is substantially not transmitted through the filter while a substantially uniform transmission of the said band frequencies is secured.

THEODORUS JOSEPHUS WEYERS.