

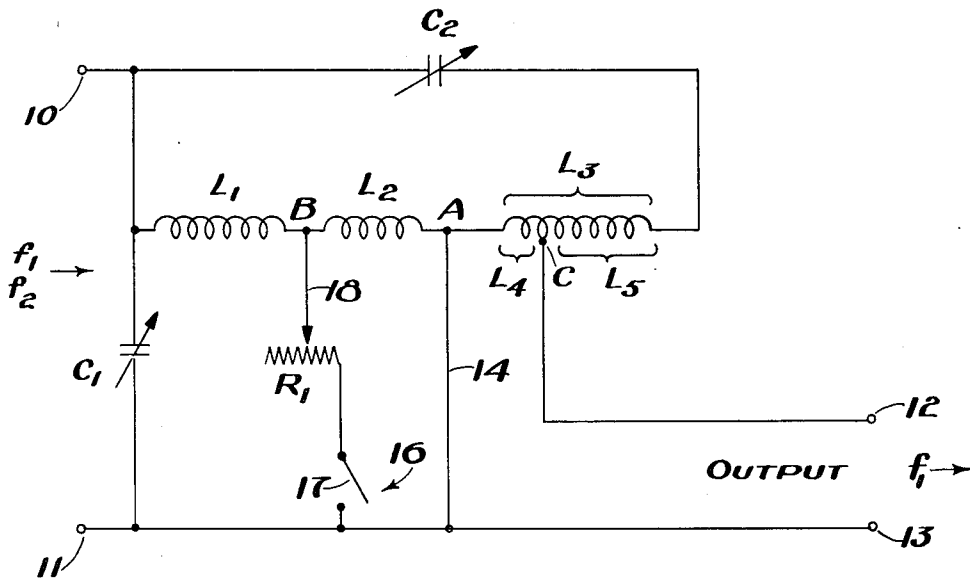
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F. J. MACLARY

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REJECTION FILTER

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INVENTOR.
FLETCHER J. MACLARY

BY

Martin Moody

ATTORNEY

1

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REJECTION FILTER

Fletcher J. Maclary, Dallas, Tex., assignor to Collins Radio Company, Cedar Rapids, Iowa, a corporation of Iowa

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This invention relates in general to filters and in particular to a rejection filter wherein it is desired to eliminate a particular frequency.

At times in radio communication, interference may occur from a transmitter which might have almost the same frequency as another station. It is very difficult to eliminate interference from an undesired frequency when it is close to a received frequency.

It is an object of this invention to provide a rejection filter which will eliminate an undesired frequency even though it is very near a frequency which it is desired to receive.

Another object of this invention is to provide means for removing an undesired frequency in the vicinity of the desired passband.

A feature of this invention is found in the provision for a combination of resonant circuits which have common components and which allow the rejection of a particular undesired frequency.

Further features, objects and advantages of the invention will become apparent from the following description and claims when read in view of the drawing, in which the figure illustrates the rejection filter according to this invention.

A pair of input terminals 10 and 11 have a first condenser C_1 connected across them. A pair of output terminals 12 and 13 are provided and terminal 13 is connected to the input terminal 11. Three inductors L_1 , L_2 and L_3 are connected in series between the input terminal 10 and one side of a second condenser C_2 . The opposite side of C_2 is connected to the input terminal 10 so that it is in parallel with the three inductors.

A point A between the inductors L_2 and L_3 is connected by a lead 14 to the input and output terminals 11 and 13.

A resistor R_1 is connected to a switch 16 which is movable to engage a contact 17 connected to the input terminal 11. A movable contact 18 is engageable with the resistor R_1 and is connected electrically to point B between the inductors L_1 and L_2 .

By way of example, let it be assumed that it is desired to receive a signal of one megacycle and that it is desired to eliminate a spurious signal at 1.001 megacycles, which has a difference from the desired frequency of only one tenth of one percent.

The condenser C_1 is variable, and with inductors L_1 and L_2 form a tank circuit which may be tuned to resonance at the desired frequency of one megacycle.

The inductance L_3 is tuned to resonance at the undesired frequency of 1.001 megacycle by the condenser C_2 . The tank circuit comprising the condenser C_1 and the inductors L_1 and L_2 is constructed so that it has a high C to L ratio, whereas the circuit comprising L_3 and C_2 is constructed so as to have a high L to C ratio.

It is to be noted that the output terminal 12 is connected to a point C on the inductor L_3 so as to divide it into two inductors L_4 and L_5 .

The inductors L_2 and L_4 may be wound on a common coil form so that they are closely coupled. However,

2

L_2 is wound in the opposite direction to that of L_3 and is closely coupled to the tapped end of L_3 . The point C is tapped at approximately ten percent of the total turns of L_3 . L_2 contains an equal or smaller number of turns than L_4 .

If the input terminals 10 and 11 receive the desired frequency F_1 and the undesired frequency F_2 , only the desired frequency F_1 will appear at the output terminals 12 and 13, and the undesired frequency F_2 will be cancelled due to phase cancellation.

If the switch 16 is closed, the variable contact 18 may be adjusted on the resistor R_1 until the amplitude of the out-of-phase components of the frequency F_2 exactly balance each other out. However, frequency F_1 will pass through the filter and be separated from the undesired frequency F_2 .

It is seen that this invention provides a rejection filter wherein an undesired frequency very close to the desired passband may be eliminated.

Although this invention has been described with respect to a preferred embodiment thereof, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope of the invention, as defined by the appended claims.

I claim:

1. A filter for rejecting an undesired signal which has a frequency close to the frequency of a desired signal comprising, a pair of input terminals, a first condenser connected between said input terminals, a first and a second inductor connected in a series combination, said series combination connected in parallel with said first condenser between the input terminals, a second condenser, a third and a fourth inductor connected in series with said second condenser between said input terminals and arranged so that said second and said fourth inductors are connected together, a pair of output terminals, a first one of said output terminals being connected to the junction of said second and fourth inductors, a second one of said output terminals being connected to the junction of said third and fourth inductors so that the fourth inductor is between said output terminals, said second and fourth inductors being closely inductively coupled and being wound in opposite directions such that the degree and sense of coupling causes substantial cancellation of the undesired signal between said output terminals, the transfer characteristic of said filter being tuned to the desired frequency, and the series combination of said second condenser, said third inductor and said fourth inductor being tuned to resonance at the undesired frequency.

2. A filter for rejecting an undesired signal which has a frequency close to the frequency of a desired signal comprising, a pair of input terminals, a first condenser connected between said input terminals, a first and a second inductor connected in a series combination, said series combination connected in parallel with said first condenser between the input terminals, a second condenser, a third and a fourth inductor connected in series with said second condenser between said input terminals and arranged so that said second and said fourth inductors are connected together, a pair of output terminals, a first one of said output terminals being connected to the junction of said second and fourth inductors, a second one of said output terminals being connected to the junction of said third and fourth inductors so that the fourth inductor is between said output terminals, said second inductor containing a smaller number of turns than said fourth inductor, said second and fourth inductors being closely inductively coupled and being wound in opposite directions such that the degree and sense of coupling causes substantial cancellation of the undesired signal between said output terminals, the transfer characteristic of said filter between said input terminals and said output ter-

3

minals being tuned to the desired frequency, and the series combination of said second condenser, said third inductor and said fourth inductor being tuned to resonance at the undesired frequency.

3. A filter for rejecting an undesired signal which has a frequency close to the frequency of a desired signal comprising, a pair of input terminals, a first condenser connected between said input terminals, a first and a second inductor connected in a series combination, said series combination connected in parallel with said first condenser between the input terminals, a second condenser, a third and a fourth inductor connected in series with said second condenser between said input terminals, and arranged so that said second and said fourth inductors are connected together, a pair of output terminals, a first one of said output terminals being connected to the junction of said second and fourth inductors, a second one of said output terminals being connected to the junction of said third and fourth inductors so that the fourth inductor is between said output terminals, said second and fourth inductors being closely inductively coupled and being wound in opposite directions such that the degree and sense of coupling causes substantial cancellation of the undesired signal between said output terminals, said fourth inductor having about one-tenth the combined turns of the third and fourth inductors, the transfer characteristic from said input terminals to said output terminals of said filter being tuned to the desired frequency, and the series combination of said second condenser, said third inductor and said fourth inductor being tuned to resonance at the undesired frequency.

4. A filter having two input terminals and two tuning circuits connected in parallel between said input terminals, a first one of said circuits having a first inductive element and a first condenser connected in parallel, a second one of said circuits having a second inductive element and a second condenser connected in series, a first output terminal connected to the junction of said first and second inductive elements, said second inductive element having a tap, a second output terminal connected to said tap, said tap being located so that a relatively small portion of the total inductance of said second inductive element is included between said output terminals, said small portion of said second inductive element being closely inductively coupled to a portion of said first inductive element, said filter circuits being tuned to a certain frequency for receiving a desired signal that is applied to said input terminals, said second tuning circuit being tuned to an undesired signal which is also applied to said input terminals and which has a frequency close to the frequency of said desired signal, and said coupled portions of said first and second inductive elements being connected in the proper sense to cancel said undesired signal between said output terminals.

5. A filter having two input terminals and two resonant circuits connected in parallel between the input terminals, a first one of said resonant circuits having first and second inductors and a first condenser, said first and second inductors being serially connected across said first condenser, a second one of said resonant circuits having third and fourth inductors and a second condenser, said third and fourth inductors and said second condenser being con-

4

nected in series and arranged such that said fourth inductor is connected between said third inductor and one of said input terminals that is connected to said second inductor, a pair of output terminals for obtaining signal from across said fourth inductor, said fourth inductor being closely inductively coupled to said second inductor, said input terminals for connecting to said filter a desired signal of a certain frequency and an undesired signal of slightly different frequency from that of said desired signal, said filter being tuned to said desired signal, said second resonant circuit being tuned to said undesired signal, and said second and said fourth inductors being mutually inductively coupled in the proper sense and degree so that the undesired signal appearing in the second inductor of said first resonant circuit substantially neutralizes the undesired signal across said fourth inductor in said second resonant circuit.

6. In a filter as defined in claim 5, a variable resistor connected across said second inductor, and said resistor being adjustable for causing complete cancellation of said undesired signal across said fourth inductor.

7. A filter for rejecting an undesired signal which has a frequency close to the frequency of a desired signal, comprising two resonant circuits connected in parallel, the first one of said resonant circuits having first and second inductors and a first condenser, said first and second inductors being serially connected across said first condenser, a second one of said resonant circuits having third and fourth inductors and a second condenser, said third and fourth inductors and said second condenser being connected in series and arranged such that said fourth inductor is connected between said third inductor and the junction of said second inductor and said first capacitor, a pair of input terminals for applying signal across said resonant circuits, said first resonant circuit having a high capacitance to inductance ratio and being tuned to a desired signal of a certain frequency, said second resonant circuit having a high inductance to capacitance ratio and being tuned to an undesired signal of slightly different frequency from that of said desired signal, said second and said fourth inductors being closely inductively coupled in opposition with respect to said undesired signal so that the undesired signal is substantially cancelled across said fourth inductor, said fourth inductor having smaller number of turns than said third inductor, and said second inductor having smaller number of turns than said fourth inductor.

8. A filter as defined in claim 7 wherein said fourth inductor has one-tenth of the combined number of turns of said third and fourth inductors.

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