CLAIMS

What is claimed is:

1. A filter comprising:

acoustic wave resonators located in a first path connected between an input terminal and an output terminal; and

a cancel circuit including a second path and a first acoustic wave resonator, the second path having a first and a second nodes, each of which is located in the first path so that the second path is parallelly connected to at least a part of the acoustic wave resonators, and one end of the first acoustic wave resonator being connected to a third node that is located between the first and the second nodes in the second path and another end of the first acoustic wave resonator being connected to ground.

2. The filter according to claim 1, wherein

the first acoustic wave resonator has an anti-resonance frequency that is set to a frequency within a transition band between a passband of the filter and a blocking band on a low frequency side of the passband, and a resonance frequency that is set to a frequency within the transition band or a frequency lower than the transition band.

3. The filter according to claim 1, wherein

the cancel circuit includes a capacitor or an acoustic wave resonator that is connected in parallel to the first acoustic wave resonator.

4. The filter according to claim 1, wherein

the first acoustic wave resonator has a resonance frequency that is set to a frequency within a blocking band on a high frequency side of a passband of the filter.

5. The filter according to claim 4, wherein

the first acoustic wave resonator has a resonance frequency that is set to around a frequency that is within the blocking band on the high frequency side of the passband and at which a pass phase of the filter reverses.

6. The filter according to claim 1, wherein

the cancel circuit includes a second acoustic wave resonator that is located in the second path and is connected in series between the first and the second nodes,

the second acoustic wave resonator has an anti-resonance frequency that is set to a frequency within a blocking band on a low frequency side of a passband of the filter or a frequency lower than the blocking band, and

the first acoustic wave resonator has a resonance frequency that is set to a frequency higher than the anti-resonance frequency of the second acoustic wave resonator.

7. The filter according to claim 1, wherein

the cancel circuit includes a capacitor or a second acoustic wave resonator that is located in the second path and that is connected in series between the first and the second nodes.

8. The filter according to claim 1, wherein

the first acoustic wave resonator has two or more resonance frequencies.

9. The filter according to claim 1, wherein

the cancel circuit includes a plurality of the first acoustic wave resonators that have mutually different resonance frequencies.

10. The filter according to claim 1, wherein

the cancel circuit is connected between the input terminal and the output terminal.

11. The filter according to claim 1, wherein

a plurality of the cancel circuits are connected in parallel to at least a part of the acoustic wave resonators.

12. A communication module comprising:

the filter according to claim 1.

13. A duplexer comprising:

a first filter that is connected between an antenna terminal and a first terminal and that includes a first group of acoustic wave resonators that are located in a first path connected between the antenna terminal and the first terminal;

a second filter that is connected between the antenna terminal and a second terminal and that includes a second group of acoustic wave resonators that are located in a second path connected between the antenna terminal and the second terminal, the second filter having a passband higher than a passband of the first filter; and

a cancel circuit including a third path and a first acoustic wave resonator, the third path having a first and a second nodes, each of which is located in the first path or the second path so

that the third path is parallelly connected to at least a part of the first or second group of acoustic wave resonators, and one end of the first acoustic wave resonator being connected to a third node that is located between the first and the second nodes in the third path and another end of the first acoustic wave resonator being connected to ground.

14. The duplexer according to claim 13, wherein

the cancel circuit is connected in parallel to at least a part of the second group of acoustic wave resonators, and

the first acoustic wave resonator has an anti-resonance frequency that is set to a frequency within a guard band between a passband of the first filter and a passband of the second filter, and a resonance frequency that is set to a frequency within the guard band or a frequency lower than the guard band.

15. The duplexer according to claim 13, wherein

the cancel circuit is connected in parallel to at least a part of the first group of acoustic wave resonators, and

the first acoustic wave resonator has a resonance frequency that is set to a frequency within a passband of the second filter.

16. The duplexer according to claim 13, wherein

the cancel circuit is connected in parallel to at least a part of the second group of acoustic wave resonators and includes a second acoustic wave resonator that is located in the third path and is connected in series between the first and second nodes, and

the second acoustic wave resonator has an anti-resonance frequency that is set to a

frequency within a passband of the first filter or a frequency lower than a passband of the first filter; and

the first acoustic wave resonator has a resonance frequency that is set to a frequency higher than the anti-resonance frequency of the second acoustic wave resonator.

17. A communication module comprising:

the duplexer according to claim 13.

18. The duplexer according to claim 13, wherein

one of the first and the second nodes is directly connected to the antenna terminal and another of the first and the second nodes is directly connected to the first terminal or the second terminal.

19. The duplexer according to claim 13, wherein

the cancel circuit includes at least one of a capacitor and a second acoustic wave resonator that is located in the third path and that is connected in series between the first and the second nodes.

CLAIMS

What is claimed is:

1. A filter comprising:

acoustic wave resonators connected between an input terminal and an output terminal; and

a cancel circuit including an input connection portion and an output connection portion connected so that the cancel circuit is connected in parallel to at least a part of the acoustic wave resonators, wherein

the cancel circuit includes a first acoustic wave resonator connected between a node between the input connection portion and the output connection portion and a ground.

2. The filter according to claim 1, wherein

the first acoustic wave resonator has an anti-resonance frequency that is set to a frequency within a transition band between a passband of the filter and a blocking band on a low frequency side of the passband, and a resonance frequency that is set to a frequency within the transition band or a frequency lower than the transition band.

3. The filter according to claim 1 or 2, wherein

the cancel circuit includes a capacitor or an acoustic wave resonator that is connected in parallel to the first acoustic wave resonator.

4. The filter according to claim 1, wherein

the first acoustic wave resonator has a resonance frequency that is set to a frequency within a blocking band on a high frequency side of a passband of the filter.

5. The filter according to claim 4, wherein

the first acoustic wave resonator has a resonance frequency that is set to around a frequency that is within the blocking band on the high frequency side of the passband and at which a pass phase of the filter reverses.

6. The filter according to claim 1, wherein

the cancel circuit includes a second acoustic wave resonator connected in series between the input connection portion and the output connection portion,

the second acoustic wave resonator has an anti-resonance frequency that is set to a frequency within a blocking band on a low frequency side of a passband of the filter or a frequency lower than the blocking band, and

the first acoustic wave resonator has a resonance frequency that is set to a frequency higher than the anti-resonance frequency of the second acoustic wave resonator.

7. The filter according to any one of claims 1 through 6, wherein

the cancel circuit includes a capacitor or an acoustic wave resonator that is connected in series between the input connection portion and the output connection portion.

8. The filter according to any one of claims 1 through 7, wherein

the first acoustic wave resonator has two or more resonance frequencies.

9. The filter according to any one of claims 1 through 8, wherein

the cancel circuit includes a plurality of the first acoustic wave resonators that have mutually different resonance frequencies.

10. The filter according to any one of claims 1 through 9, wherein

the cancel circuit is connected between the input terminal and the output terminal.

11. The filter according to any one of claims 1 through 10, wherein

a plurality of the cancel circuits are connected in parallel to at least a part of the acoustic wave resonators.

12. A duplexer comprising:

a first filter that is connected between an antenna terminal and a first terminal and includes acoustic wave resonators;

a second filter that is connected between the antenna terminal and a second terminal, includes acoustic wave resonators, and has a passband higher than a passband of the first filter; and

a cancel circuit that includes an input connection portion and an output connection portion connected so that the cancel circuit is connected in parallel to at least a part of the acoustic wave resonators included in the first filter or to at least a part of the acoustic wave resonators included in the second filter, wherein

the cancel circuit includes a first acoustic wave resonator connected between a node between the input connection portion and the output connection portion and a ground.

13. The duplexer according to claim 12, wherein

the cancel circuit is connected in parallel to at least a part of the acoustic wave resonators included in the second filter, and

the first acoustic wave resonator has an anti-resonance frequency that is set to a frequency within a guard band between a passband of the first filter and a passband of the second filter, and a resonance frequency that is set to a frequency within the guard band or a frequency lower than the guard band.

14. The duplexer according to claim 12, wherein

the cancel circuit is connected in parallel to at least a part of the acoustic wave resonators included in the first filter, and

the first acoustic wave resonator has a resonance frequency that is set to a frequency within a passband of the second filter.

15. The duplexer according to claim 12, wherein

the cancel circuit is connected in parallel to at least a part of the acoustic wave resonators included in the second filter and includes a second acoustic wave resonator that is connected in series between the input connection portion and the output connection portion, and

the second acoustic wave resonator has an anti-resonance frequency that is set to a frequency within a passband of the first filter or a frequency lower than a passband of the first

filter; and

the first acoustic wave resonator has a resonance frequency that is set to a frequency higher than the anti-resonance frequency of the second acoustic wave resonator.

16. The duplexer according to claim 13 or 15, wherein

the cancel circuit is connected between the antenna terminal and the second terminal.

17. The duplexer according to claim 14, wherein

the cancel circuit is connected between the antenna terminal and the first terminal.

18. A communication module comprising:

the filter according to any one of claims 1 through 11 or the duplexer according to any one of claims 12 through 17.