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(54) **ANTENNA ASSEMBLY AND PORTABLE TERMINAL HAVING THE SAME**

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(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

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(Under 37 CFR 1.47)

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Filed: **Sep. 14, 2007**

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H01Q 1/52 (2006.01)

(52) **U.S. Cl.**
USPC ..... **343/841**; 343/700 MS; 343/702

(58) **Field of Classification Search**
USPC ..... 343/700 MS, 702, 841, 846
See application file for complete search history.

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(57) **ABSTRACT**

An antenna assembly, and a portable terminal having the same. The antenna assembly according to an embodiment comprises: a circuit board having a ground plane at a predetermined region; first and second antenna conductors spaced from each other at one side of the ground plane; and a shielding wall disposed between the ground plane and the antenna conductors, for reducing a coupling between the first and second antenna conductors. Since a plurality of antennas are mounted at a small space inside the portable terminal with maintaining their functions, an isolation characteristic between the antennas is enhanced, and a mutual coupling between the antennas is minimized.

42 Claims, 7 Drawing Sheets

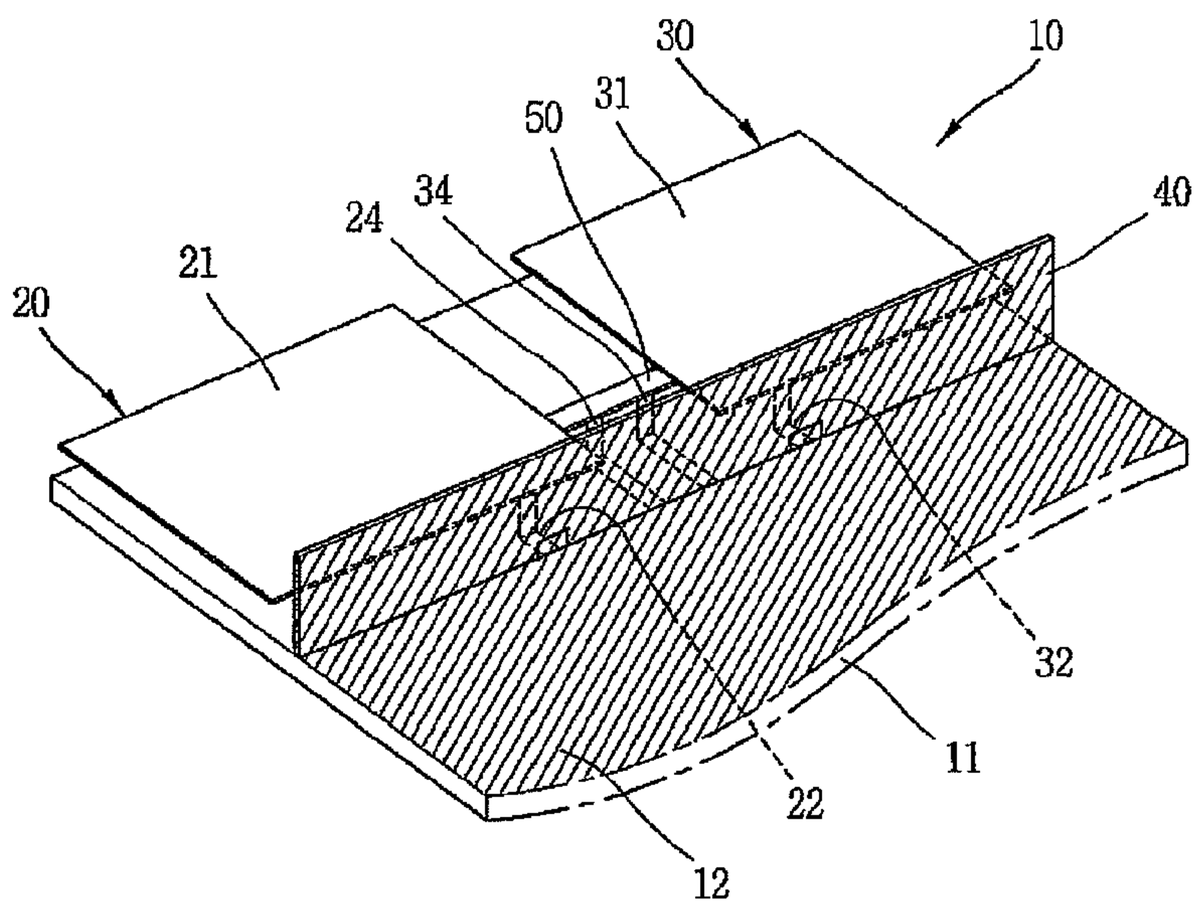


FIG. 1

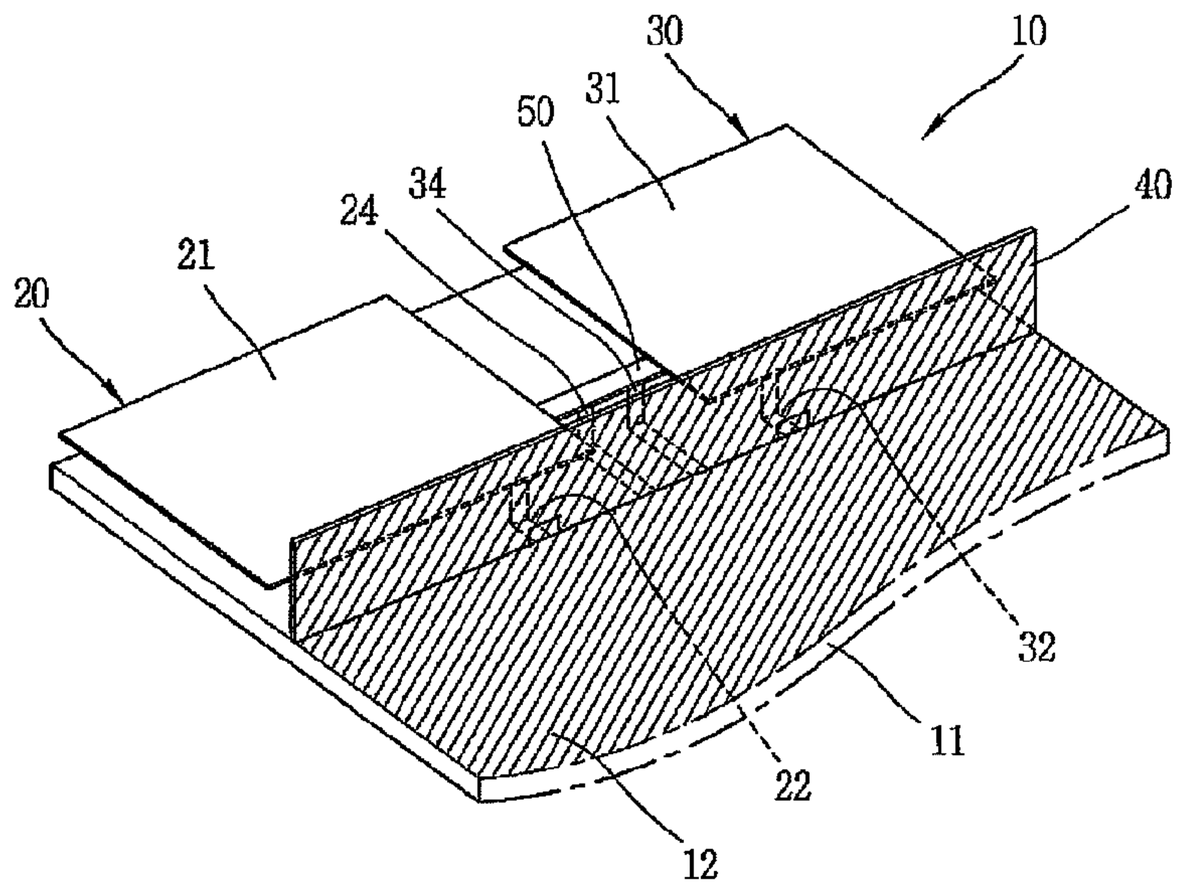

30
10
50
31
34
24
40
21
20
32
11
22
12

FIG. 2

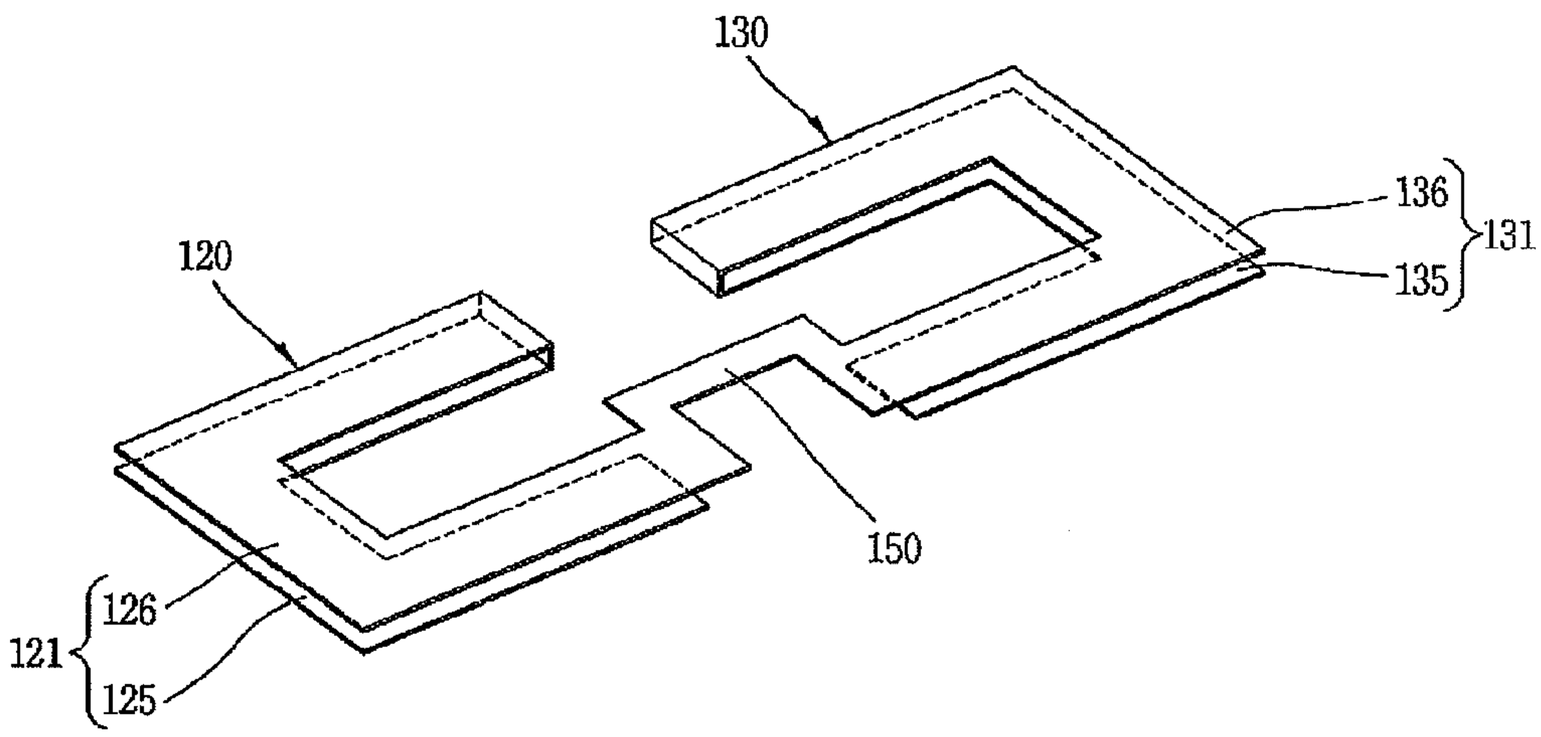

130
136
131
120
135
150
126
121
125

FIG. 3

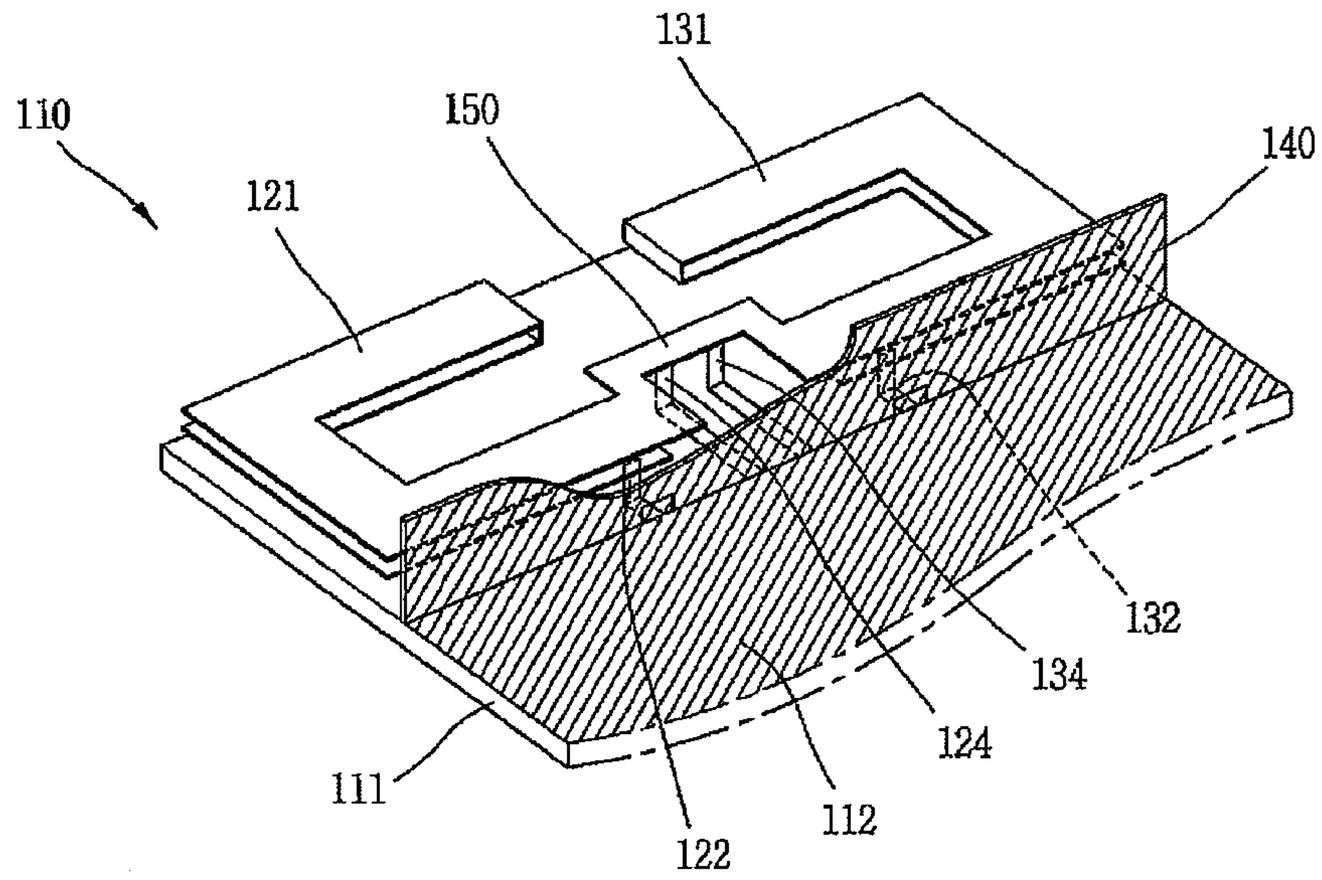

131
110
150
140
121
132
134
124
111
112
122

FIG. 4

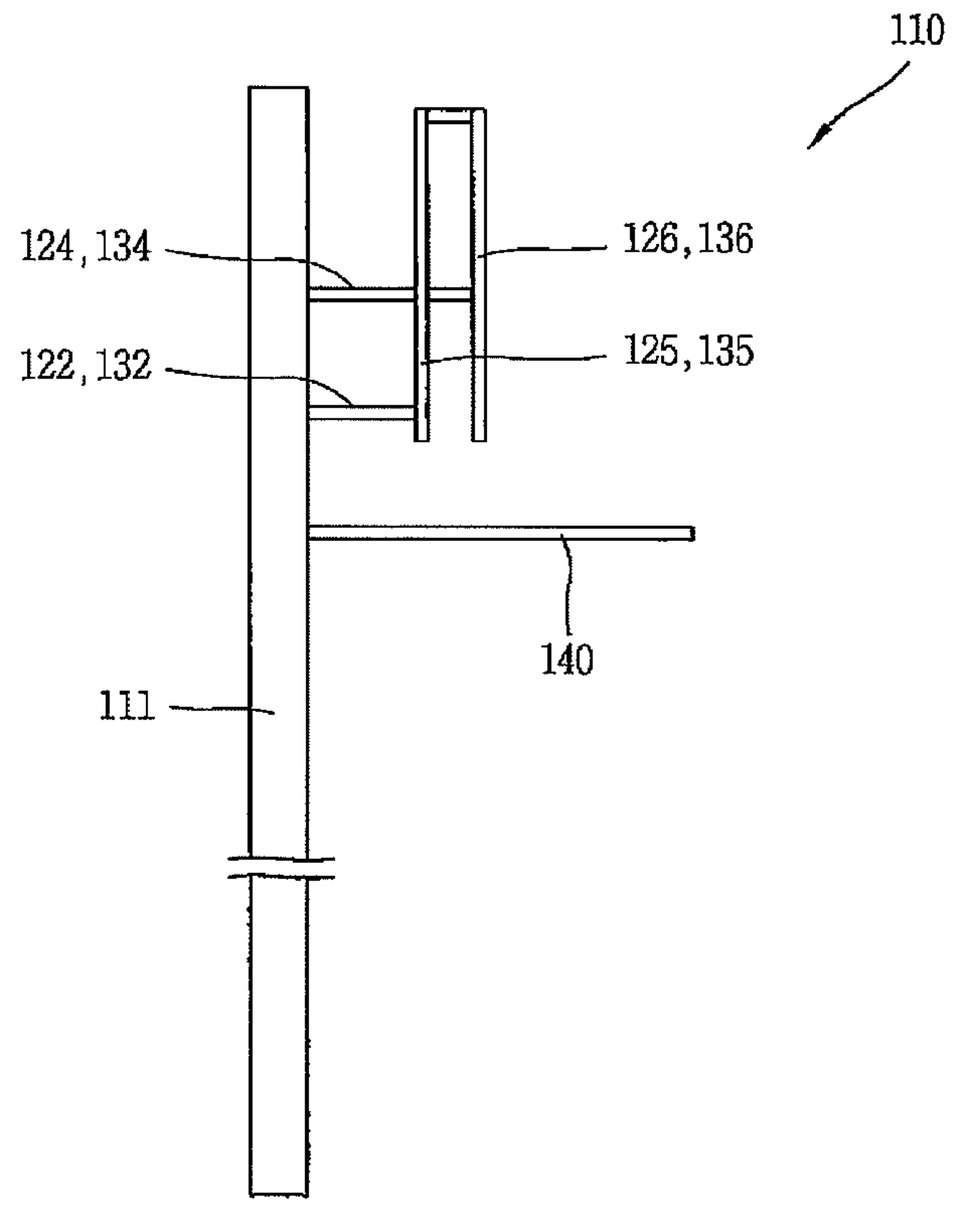

110
124, 134
126, 136
122, 132
125, 135
140
111

FIG. 5

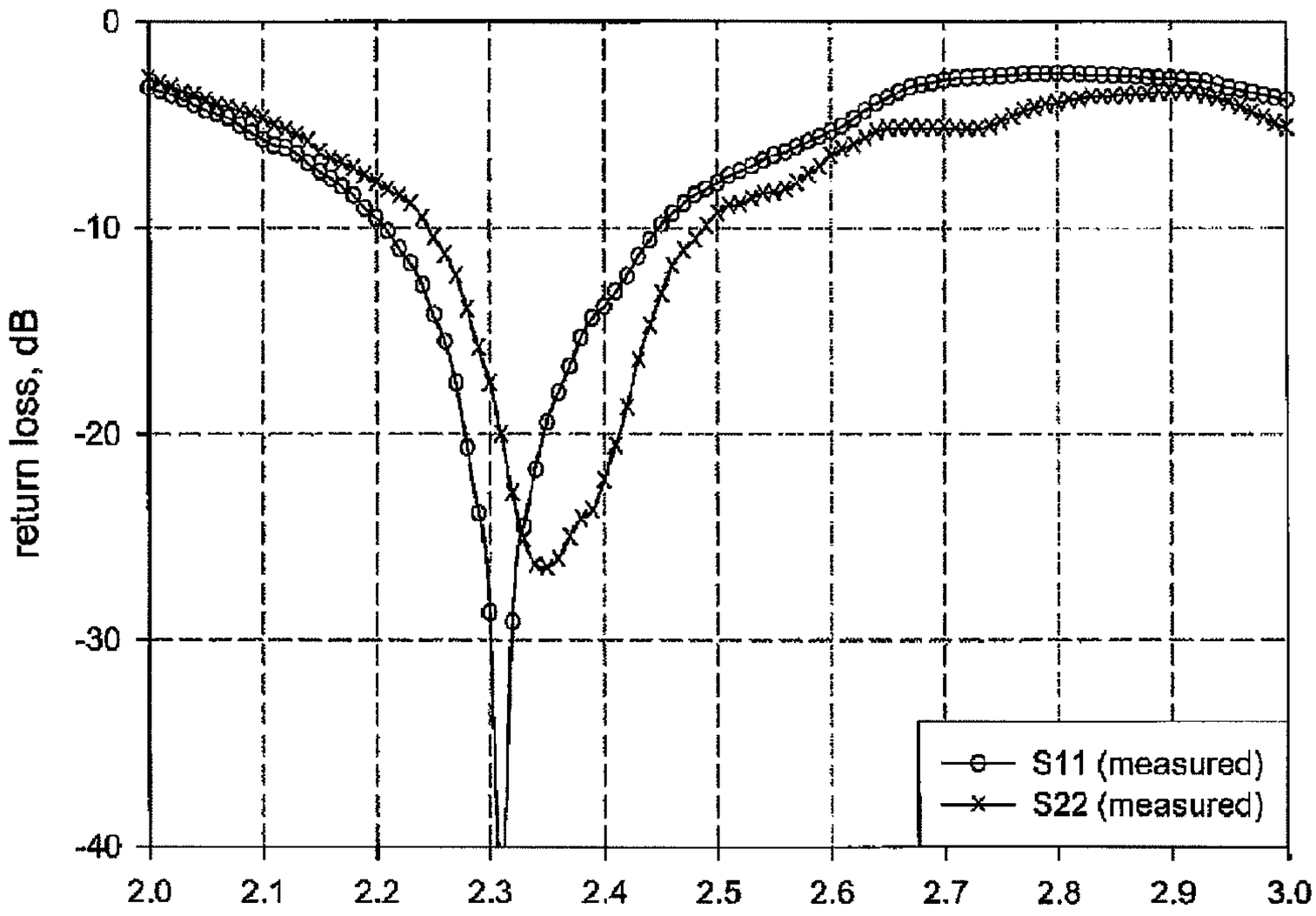

0
-10
-20
-30
-40
return loss, dB
S11 (measured)
S22 (measured)
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
frequency, GHz

FIG. 6

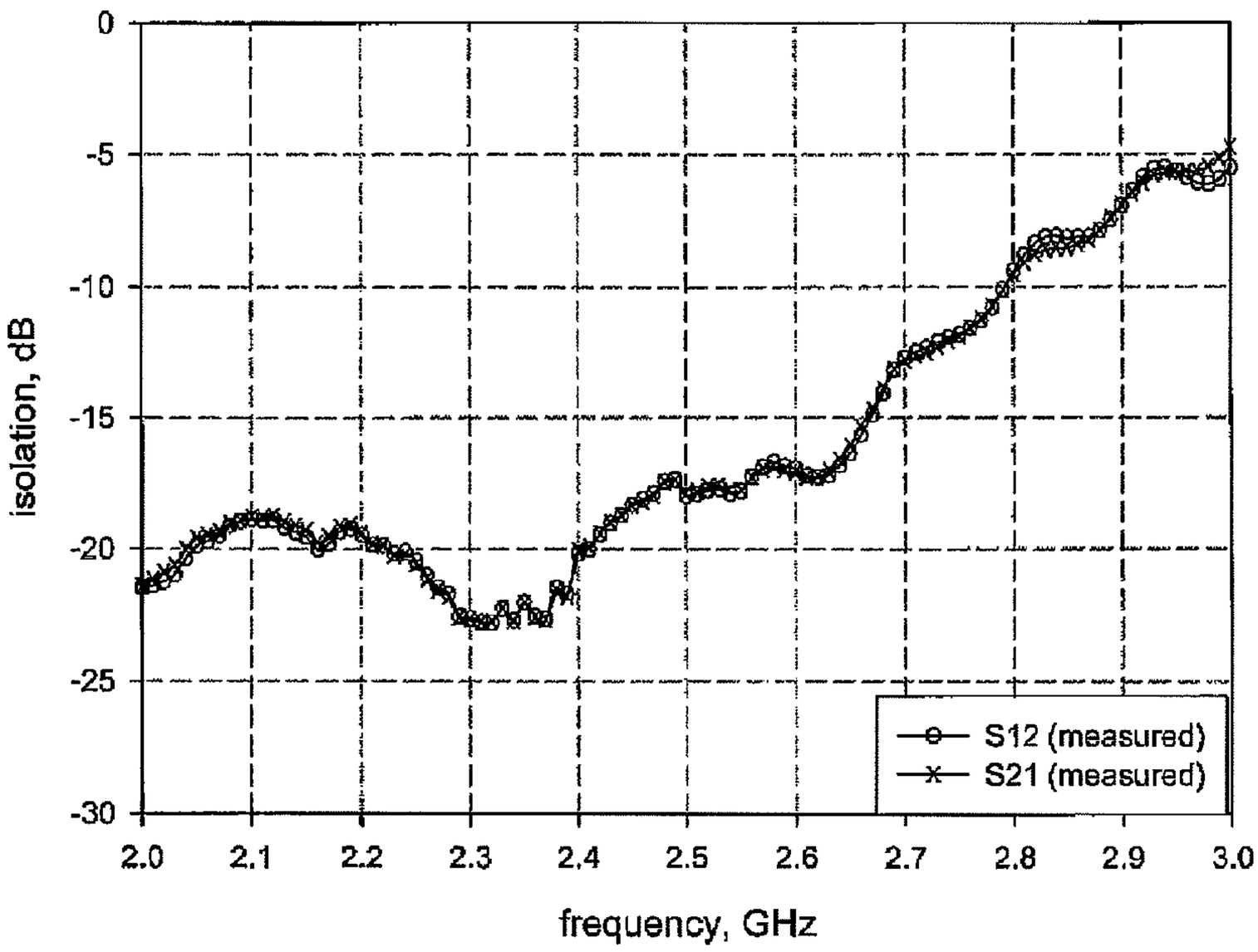

0
-5
-10
-15
-20
-25
-30
isolation, dB
S12 (measured)
S21 (measured)
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
frequency, GHz

FIG. 7

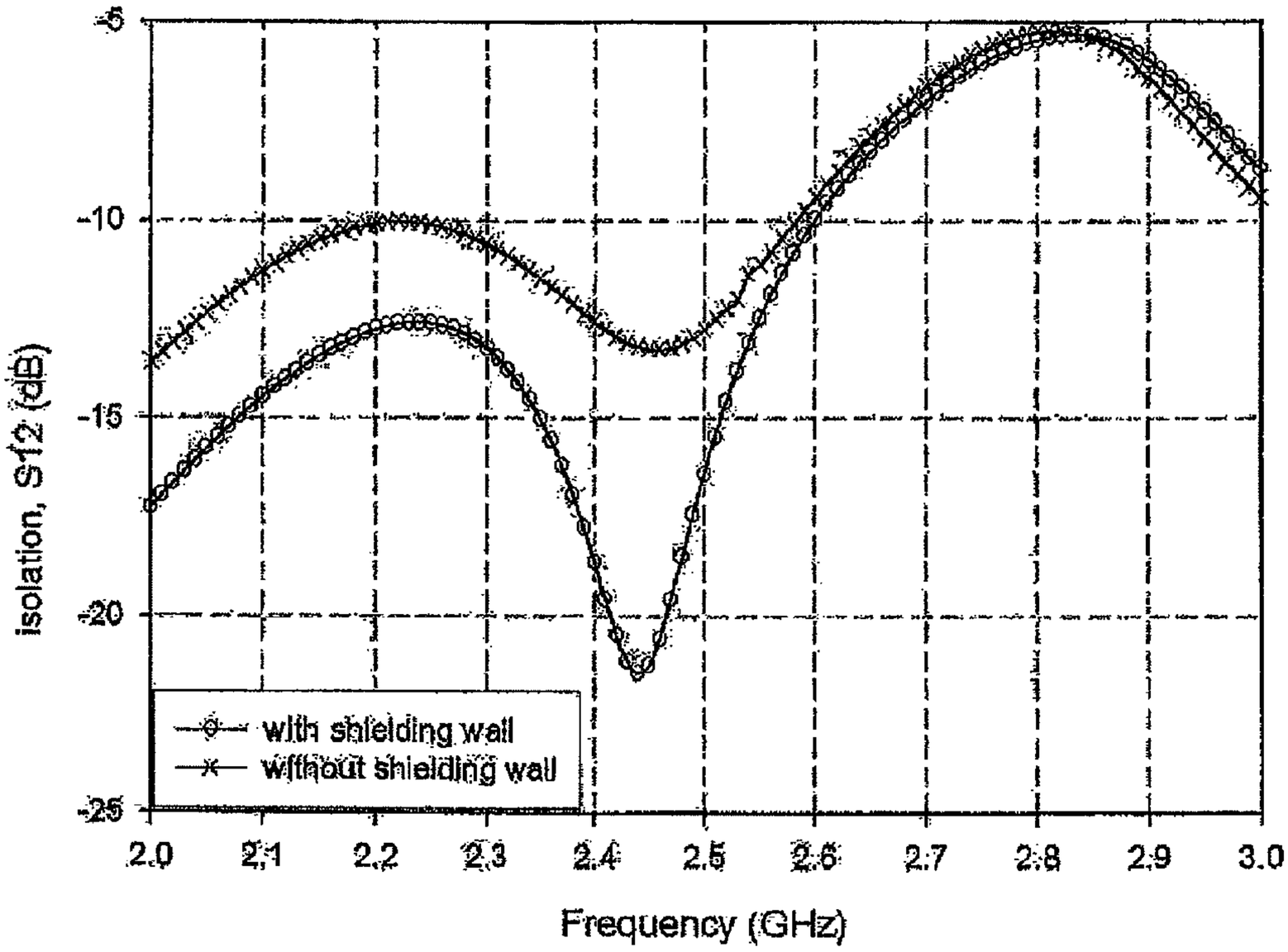

-5
-10
-15
-20
-25
isolation, S12 (dB)
with shielding wall
without shielding wall
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
Frequency (GHz)

FIG. 8

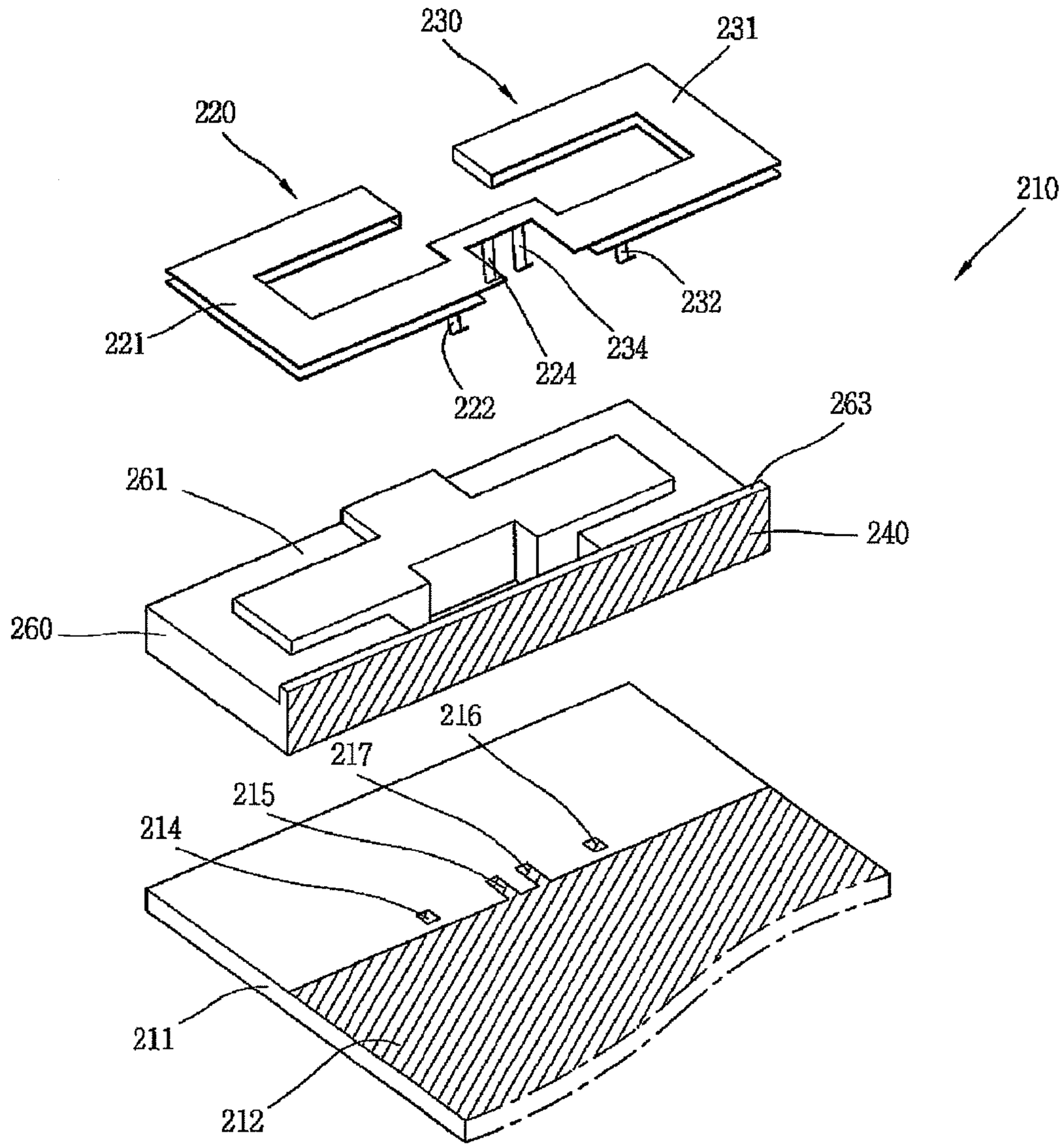
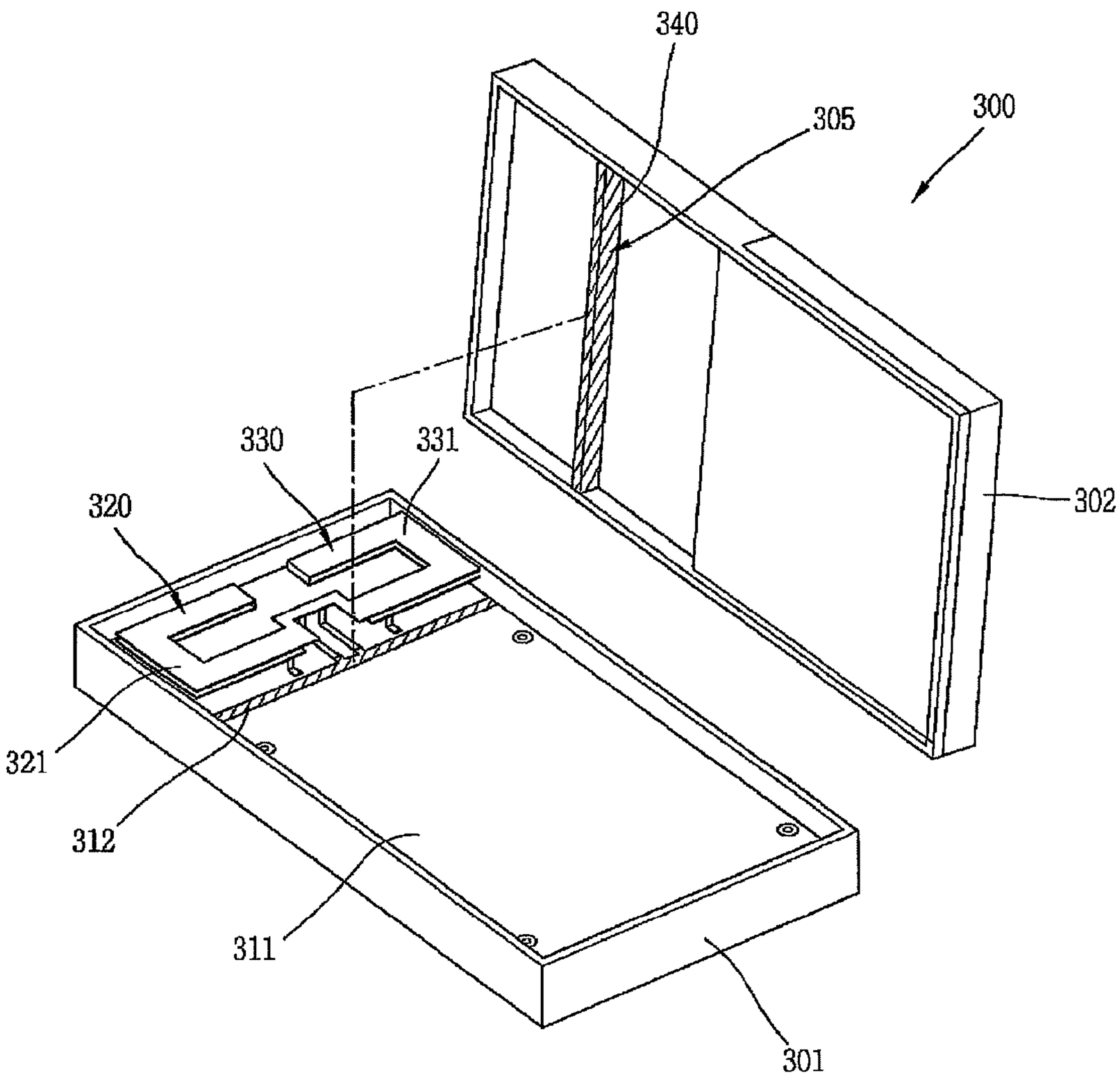

230
231
220
210
221
232
234
224
222
263
261
240
260
216
217
215
214
211
212

FIG. 9



ANTENNA ASSEMBLY AND PORTABLE TERMINAL HAVING THE SAME

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

RELATED APPLICATION

This is a reissue application of Ser. No. 11/855,716 (now U.S. Pat. No. 7,609,221), which is incorporated by reference in its entirety.

The present disclosure relates to subject matter contained in priority Korean Application No. 10-2006-0094121, filed on Sep. 27, 2006, which is herein expressly incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present disclosure relates to an antenna assembly having an enhanced isolation characteristic, and a portable terminal having the same.

2. Description of the Background Art

A portable terminal is a kind of portable electronic device having at least one of an audio call function, a video call function, an information input/output function, a data storage function, etc.

As the portable terminal has various functions, the portable terminal is provided with complex functions such as a function for capturing a photo or a moving image, a function for reproducing a music file or a moving image file, and a function for receiving broadcasting data.

More efforts are being performed in a hardware or software aspect so as to implement the various functions of the portable terminal. A user's interface for allowing a user to easily and conveniently search or select a function is being provided.

As information communication technique develops, an amount of data that can be wirelessly transceived is increased, and a transmission speed of data becomes fast. Accordingly, an antenna for wirelessly receiving a large amount of data with high quality even while a user moves is required.

In designing an antenna for wirelessly transmitting data with high speed, a so-called "cancel-out" due to an interference between signals received through different paths occurs. Accordingly, required is an antenna that matches with an appearance of the portable terminal and is suitable for the portable terminal having components integrated with each other with high density.

SUMMARY OF THE INVENTION

Therefore, an object of the present disclosure is to provide an antenna assembly capable of implementing a diversity by arranging a plurality of antennas at a small space inside a portable terminal.

Another object of the present disclosure is to provide an antenna assembly capable of minimizing a lowering of an isolation characteristic between a plurality of antennas.

To achieve these and other advantages and in accordance with the purpose of the present disclosure, as embodied and broadly described herein, there is provided an antenna assembly, comprising: a circuit board having a ground plane at a predetermined region; a first antenna conductor and a second antenna conductor spaced from each other at one side of the ground plane; and a shielding wall disposed between the ground plane and the antenna conductors, for reducing a coupling between the first and second antenna conductors.

To achieve these and other advantages and in accordance with the purpose of the present disclosure, as embodied and broadly described herein, there is also provided a portable terminal having the antenna assembly.

According to the present invention, since a plurality of antennas are mounted at a small space inside a portable terminal with maintaining their functions, an isolation characteristic between the antennas is enhanced, and a mutual coupling between the antennas is minimized.

When a cellular phone, a PDA (Personal Digital Assistants), a notebook computer, a PMP (Personal Multimedia Player), and various kinds of portable terminals are to adopt a built-in multiple antenna for implementing 3.5 G and 4 G mobile communication service, the antenna assembly can be effectively used. Also, the antenna assembly can be applicable to various built-in MIMO/Diversity antennas.

The foregoing and other objects, features, aspects and advantages of the present disclosure will become more apparent from the following detailed description of the present disclosure when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

FIG. **1** is a perspective view showing an antenna assembly according to a first embodiment of the present invention;

FIG. **2** is a perspective view showing an antenna conductor of an antenna assembly according to a second embodiment of the present invention;

FIG. **3** is a perspective view showing an antenna assembly having the antenna conductor of FIG. **2** therein;

FIG. **4** is a side view showing the antenna assembly of FIG. **3**;

FIG. **5** is a graph showing an example of an 'S' parameter characteristic according to a return loss of the antenna assembly of the present invention;

FIG. **6** is a graph showing an example of an isolation characteristic of the antenna assembly according to the present invention;

FIG. **7** is a graph showing an example of an isolation characteristic of the antenna assembly according to whether a shielding wall exists or not;

FIG. **8** is an exploded perspective view showing an antenna assembly according to a third embodiment of the present invention; and

FIG. **9** is an exploded perspective view showing a portable terminal having an antenna assembly according to a fourth embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the preferred embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings.

Hereinafter, an antenna assembly and a portable terminal having the same according to the present invention will be explained in more detail with reference to the attached drawings.

FIG. **1** is a perspective view showing an antenna assembly according to a first embodiment of the present invention.

Referring to FIG. **1**, an antenna assembly **10** includes first and second antennas **20** and **30** for diversity.

The first and second antennas **20** and **30** are connected to a circuit board **11** having a ground plane **12** at a predetermined region, thereby implementing a wireless communication characteristic.

The first and second antennas **20** and **30** may be integrally arranged at one side of the circuit board **11** so as to be disposed at a limited space of a small and slim device such as a cellular phone, a PDA, and a notebook.

The first antenna **20** has a first antenna conductor **21** for transceiving (transmitting and receiving) a wireless signal. The second antenna **30** also has a second antenna conductor **31** having a length or a pattern for transceiving a signal in the same operation bandwidth as the first antenna **20**. The second antenna conductor **31** is spaced from the first antenna conductor **21**.

In a state that the number of antennas of the antenna assembly **10** is increased, when data is transmitted from a base station through a plurality of paths, signals received at a receiving end of the portable terminal through the paths are detected thus to decrease an interference between the signals. Accordingly, a MIMO (Multi-input Multi-Output) antenna can be easily implemented.

The first and second antennas **20** and **30** have feeding portions **22** and **32** for feeding a signal to the circuit board **11**, respectively. The feeding portions **22** and **32** may be disposed at positions where resonance frequencies of the first and second antennas **20** and **30** are determined.

The first and second antenna conductors **21** and **31** may be formed to have various patterns according to an operation bandwidth. FIGS. **2** to **4** respectively show an antenna having a folded portion.

Referring to FIG. **1**, the first and second antenna conductors **21** and **31** are electrically connected to each other by a connecting portion **50**. Ground connecting portions **24** and **34** for respectively connecting the first and second antenna conductors **21** and **31** to the ground plane **12** are formed at the connecting portion **50**.

The connecting portion **50** allows the first and second antennas **20** and **30** to be less influenced by a surface current of the circuit board **11** by balancing the first and second antennas **20** and **30**. For instance, the first and second antennas **20** and **30** are formed to be symmetrical or substantially symmetrical to each other.

A shielding wall **40** for reducing a coupling between the first and second antenna conductors **21** and **31** is disposed between the ground plane **12** and the first and second antenna conductors **21** and **31**. The shielding wall **40** shields an electromagnetic interference between the circuit board **11** and the first and second antenna conductors **21** and **31** thereby decreasing a mutual coupling between the first and second antennas **20** and **30** and enhancing an isolation characteristic of the antenna assembly **10**.

FIG. **2** is a perspective view showing an antenna conductor of an antenna assembly according to a second embodiment of the present invention.

Referring to FIG. **2**, first and second antenna conductors **121** and **131** have a predetermined pattern, respectively.

That is, the first and second antenna conductors **121** and **131** include first pattern portions **125** and **135** each having a first height from a ground plane **112**, and second pattern portions **126** and **136** each having a second height higher than the first height.

The first pattern portion **125** of the first antenna conductor **121** may have a '⊏' shape or other shapes. The first pattern portion **135** of the second antenna conductor **131** is formed to be symmetrical with the first pattern portion **125** of the first antenna conductor **121**.

The first pattern portions **125** and **135**, and the second pattern portions **126** and **136** have shapes corresponding to each other, respectively, and have folded portions at opposite positions to the feeding portions. In the preferred embodiment, the first and second pattern portions **135** and **136** of the second antenna conductor **131** are extending from each other in parallel or in substantially parallel. Similarly, the first and second pattern portions **125** and **126** of the first antenna conductor **121** are extending from each other in parallel or substantially parallel, respectively.

Accordingly, the first and second antenna conductors **121** and **131** can respectively have a decreased volume with a sufficient resonance length, thereby being easily mounted in the portable terminal.

FIG. **3** is a perspective view showing an antenna assembly having the antenna conductor of FIG. **2** therein.

Referring to FIG. **3**, a shielding wall **140** is configured as a conductor plate raised, preferably vertically, from a ground plane **112** of a circuit board **111**. The shielding wall **140** serves to enhance an isolation characteristic between the first and second antenna conductors **121** and **131**. Preferably, the shielding wall **140** is disposed between the circuit board **111** and the first and second antenna conductors **121** and **131** so as to shield a current applied to the circuit board **111**. The shielding wall **140** shields a coupling between a surface current of the circuit board **111** and the first and second antenna conductors **121** and **131**, thereby reducing an interference therebetween. The shielding wall **140** may have various shapes. For example, FIG. **3** shows the shielding wall **140** having a rectangular shape.

Feeding portions **122** and **132** are connected to specific positions of the first pattern portions **125** and **135** of the first and second antenna conductors **121** and **131**. The positions of the feeding portions **122** and **132** determine resonance frequencies of the first and second antennas **120** and **130**. The reason is because the positions of the feeding portions **122** and **132** determine electric lengths of the first and second antennas **120** and **130**. The feeding portions **122** and **132** serve as passages through which radio frequency (RF) signals are inputted to the first and second antenna conductors **121** and **131**. The feeding portions **122** and **132** are disposed so as not to be connected to the shielding wall **140**.

Ground connecting portions **124** and **134** are connected to the shielding wall **140** and are connected at two arbitrary positions of a connecting portion **150**. The positions of the ground connecting portions **124** and **134** can control an isolation characteristic of the antenna assembly. Referring to FIG. **3**, the ground connecting portions **124** and **134** are vertically extending from the connecting portion **150** and then extend in parallel or substantially parallel with the ground plane **112** so as to be connected to the shielding wall **140**.

The ground connecting portions **124** and **134** serve as inductors between the shielding wall **140** and the antenna conductors **121** and **131**. A capacitance element is disposed between the two ground connecting portions **124** and **134**. Therefore, the ground connecting portions **124** and **134**, and the shielding wall **140** are operated in the same way as an LC high pass filter. The position change of the ground connecting portions **124** and **134** determines an operation frequency of the LC high pass filter. Each optimum position of the feeding portions **122** and **132** and the ground connecting portions **124**

and **134** may determine a function and an isolation characteristic of the antenna assembly at a desired frequency bandwidth.

FIG. **4** is a side view showing the antenna assembly of FIG. **3**, which shows each position and each configuration of the first and second antenna conductors **121** and **131**, the ground connecting portions **124** and **134**, the ground plane **112**, and the shielding wall **140**.

FIG. **5** is a graph showing an 'S' parameter characteristic according to a return loss of the antenna assembly of the present invention.

The 'S' (scattering) parameter indicates a ratio between an output voltage and an input voltage with respect to frequency. For instance, 'S**21**' indicates a ratio of a voltage outputted to a port No. 2 with respect to a voltage inputted from a port No. 1. That is, 'S**21**' represents an amount of an output voltage to a port No. 2 versus an input voltage from a port No. 1.

Referring to FIG. **5**, 'S**11**' indicates an output voltage versus an input voltage with respect to the first antenna **120**. The 'S**11**' means a return loss of the first antenna **120** which represent a reflected degree of a signal that has not been emitted to the air. A frequency measured under the return loss of −10 dB is in a range of 2.25~2.48 GHz, which means that the antenna can be operated at a WiBro band of 2.3~2.39 GHz.

'S**22**' indicates a loss rate of the second antenna **130**. A frequency measured under the return loss of −10 dB is in a range of 2.22~2.45 GHz, which means that the antenna can be operated at a WiBro band. Resonance frequencies of the first and second antennas **120** and **130** can be set differently according to a desired bandwidth, and can become different according to lengths and patterns of the first and second antenna conductors **121** and **131**, positions of the feeding portions **122** and **132**, etc.

The above features of the invention allow first and second antennas **120** and **130** to be smoothly operated at a specific frequency bandwidth.

FIG. **6** is a graph showing an isolation characteristic of the antenna assembly according to the present invention.

Referring to FIG. **6**, 'S**12**' indicates a ratio of a voltage outputted to the feeding portion **132** of the second antenna **130** with respect to a voltage inputted from the feeding portion **122** of the first antenna **120**. 'S**21**' indicates a ratio of a voltage outputted to the feeding portion **122** of the first antenna **120** with respect to a voltage inputted from the feeding portion **132** of the second antenna **130**.

The 'S**12**' and 'S**21**' maintain isolation values less than −10 dB at a WiBro band (2.3~2.39 GHz).

FIG. **7** is a graph showing an isolation characteristic of the antenna assembly of the present invention according to whether a shielding wall exists or not.

FIG. **7** shows different voltages at a WiBro bandwidth according to whether the shielding wall **140** exists or not. Referring to FIG. **7**, the 'S**12**' when the shielding wall **140** exists is much smaller than the 'S**12**' when the shielding wall **140** does not exist. This means that the first and second antennas **120** and **130** have an enhanced isolation characteristic with respect to each other.

FIG. **8** is an exploded perspective view showing an antenna assembly according to a third embodiment of the present invention.

Referring to FIG. **8**, an antenna assembly **210** comprises the first and second antennas **220** and **230** each having a predetermined pattern, a circuit board **211** having a ground plane **212**, and a carrier **260** for supporting the first and second antennas **220** and **230** to the circuit board **211**.

The carrier **260** is formed of a dielectric substance, and has a mounting unit **261** for supporting the first and second antennas **220** and **230**. Feeding portions **222** and **232** of the first and second antennas **220** and **230**, and ground connecting portions **224** and **234** of the first and second antennas **220** and **230** are formed to have elastic finger types contacting pads **214**, **216**, **215** and **217** formed on the circuit board **211**, respectively.

The first and second antennas **220** and **230** are electrically connected to each other, thereby being less influenced by a surface current of the circuit board **211** and being less influenced by a user's body such as hands or a head.

In the present invention, a carrier wall **263** is formed at a contact surface of the carder **260** to the ground plane **212**. A shielding layer **240** having a conductivity is formed at the carrier wall **263**. The shielding layer may be implemented using a conductive material or as a metallic material or other conductive material coated on the carrier wall **263**. The shielding layer **240** directly contacts the ground plane **212**, thereby enhancing an isolation characteristic of the first and second antennas **220** and **230**.

FIG. **9** is an exploded perspective view showing a portable terminal having an antenna assembly according to a fourth embodiment of the present invention.

Referring to FIG. **9**, a portable terminal **300** comprises the first and second cases **301** and **302** that form an appearance thereof. An antenna assembly for implementing a mobile communication service is provided at the first and second antennas **301** and **302**. Since the antenna assembly is mounted in the portable terminal **300**, the portable terminal **300** has an enhanced appearance.

The first and second antennas **320** and **330** of the antenna assembly are disposed at one side of a circuit board **311** in parallel or substantially parallel to the circuit board **311**, and are connected to the circuit board **311** by the aforementioned feeding method.

The first and second antennas **320** and **330** are electrically connected to each other, thereby being less influenced by a surface current of the circuit board **311** due to a reciprocal balance therebetween and being less influenced by a user's body such as hands or a head.

In the present invention, a shielding layer **340** is formed at a rib **305** disposed at a second case **302**, thereby reducing a coupling between the first and second antennas **320** and **330**. The rib **305** is formed so that the first and second antennas **320** and **330** can substantially form an angle of 90° from a ground plane **312**. The rib **305** directly contacts the ground plane **312**.

The shielding layer **340** may be implemented as a conductive material such as an EMI material is coated on the rib **305** of the second case **302**.

In the present invention, the antenna assembly **310** can be isolated from RF components of the circuit board **311**, and can enhance an isolation characteristic between the first and second antennas **320** and **330**. Furthermore, the shielding layer **340** may be implemented as a metallic shielding can for shielding the RF components.

The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present disclosure. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

As the present features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. An antenna assembly, comprising:

a circuit board having a ground plane at a predetermined region;

first and second antenna conductors spaced from each other at one side of the ground plane; and

a shielding wall disposed between the ground plane and the first and second antenna conductors, for reducing a coupling between the first and second antenna conductors,

wherein the shielding wall is formed of a sheet having a conductivity or is coated with a conductive material,

wherein each of the first and second antenna conductors respectively comprises a first pattern portion having a first height from the ground plane and a second pattern portion having a second height higher than the first height, and

wherein the first and second pattern portions are connected to each other.

2. The antenna assembly of claim **1**, wherein the shielding wall substantially forms an angle of 90° from the ground plane.

[3. The antenna assembly of claim **1**, wherein each of the first and second antenna conductors respectively comprises:

a first pattern portion having a first height from the ground plane; and

a second pattern portion having a second height higher than the first height

wherein the first and second pattern portions are connected to each other.**]**

4. The antenna assembly of claim **[3]** *1*, wherein the second pattern portion of the first antenna conductor and the second pattern portion of the second antenna conductor are electrically connected to each other.

5. The antenna assembly of claim **4**, wherein each of the first and second antenna conductors comprises a feeding portion for feeding signals to the circuit board, *and*

wherein the feeding portion is connected to the first pattern portion.

6. The antenna assembly of claim **[3]***1*, wherein the first and second antenna conductors are formed to be substantially symmetrical to each other.

7. The antenna assembly of claim **[6]** *5*, wherein each of the first and second antenna conductors further comprise a ground connecting portion for connecting the first and second antenna conductors to the ground plane, *and*

wherein the ground connecting portion is disposed at a connection part between the second pattern portion of the first antenna conductor and the second pattern portion of the second antenna conductor.

8. The antenna assembly of claim **7**, wherein a capacitance element is further disposed between the ground connecting portion of the first antenna conductor and the ground connecting portion of the second antenna conductor, and an inductance element is further disposed between the shielding wall and the first and second antenna conductors and the shielding wall.

9. A portable terminal, comprising:

a case; and

an antenna assembly mounted in the case and implementing a mobile communication service, and

wherein the antenna assembly comprises:

a circuit board having a ground plane at a predetermined region;

first and second antenna conductors spaced from each other at one side of the ground plane; and

a shielding wall disposed between the ground plane and the first and second antenna conductors, for reducing a coupling between the first and second antenna conductors,

wherein the shielding wall is formed of a sheet having a conductivity or is coated with a conductive material, *and*

wherein the shielding wall is formed as an EMI (electromagnetic interference) material deposited on a rib protruding from an inner surface of the case.

10. The portable terminal of claim **9**, wherein the shielding wall substantially forms an angle of 90° from the ground plane.

[11. The portable terminal of claim **9**, wherein the shielding wall is formed as an EMI (electromagnetic interference) material deposited on a rib protruding from an inner surface of the case.**]**

12. The portable terminal of claim **9**, wherein the shielding wall is formed as a dielectric carrier for supporting the first and second antenna conductors.

13. The portable terminal of claim **9**, wherein the shielding wall is formed as a shielding can for shielding RF components of the circuit board.

14. The portable terminal of claim **9**, wherein each of the first and second antenna conductors respectively comprises:

a first pattern portion having a first height from the ground plane; and

a second pattern portion having a second height higher than the first height, and

wherein the first and second pattern portions are connected to each other.

15. The portable terminal of claim **14**, wherein the second pattern portion of the first antenna conductor and the second pattern portion of the second antenna conductor are electrically connected to each other.

16. The portable terminal of claim **14**, wherein the first and second antenna conductors are formed to be substantially symmetrical to each other.

17. The portable terminal of claim **16**, wherein each of the first and second antenna conductors comprise a feeding portion for feeding signals to the circuit board, *and*

wherein the feeding portion is connected to the first pattern portion.

18. The portable terminal of claim **16**, wherein each of the first and second antenna conductors further comprise a ground connecting portion for connecting the first and second antenna conductors to the ground plane, *and*

wherein the ground connecting portion is disposed at a connection part between the second pattern portion of the first antenna conductor and the second pattern portion of the second antenna conductor.

19. The portable terminal of claim **18**, wherein a capacitance element is further disposed between the ground connecting portion of the first antenna conductor and the ground connecting portion of the second antenna conductor, and an inductance element is further disposed between the shielding wall and the first and second antenna conductors.

[20. An antenna assembly, comprising:
a circuit board having a ground plane at a predetermined region;
first and second antenna conductors spaced from each other at one side of the ground plane; and
a shielding wall disposed between the ground plane and the first antenna conductor and between the ground plane and the second antenna conductor, for reducing a coupling between the first and second antenna conductors,]

[21. A portable terminal, comprising:
a case; and
an antenna assembly mounted in the case and implementing a mobile communication service,
wherein the antenna assembly comprises:
a circuit board having a ground plane at a predetermined region;
first and second antenna conductors spaced from each other at one side of the ground plane; and
a shielding wall disposed between the ground plane and the first antenna conductor and between the ground plane and the second antenna conductor, for reducing a coupling between the first and second antenna conductors.]

22. An antenna assembly, comprising:
a printed circuit board;
at least one antenna radiation unit disposed next to the printed circuit board; and
a shielding surface disposed between the printed circuit board and the at least one antenna radiation unit so as to reduce an interference between the printed circuit board and the at least one antenna radiation unit,
wherein at least a portion of the shielding surface comprises a conductive material,
wherein the shielding surface is formed to be substantially perpendicular to the printed circuit board, and
wherein the printed circuit board is installed in a first outer casing among two outer casing enclosing the printed circuit board and the at least one antenna radiation unit.

23. The antenna assembly of claim 22, wherein the printed circuit board has a rectangular shape and one side of the printed circuit board where the at least one antenna radiation unit is disposed is a shorter side of the rectangular shape.

24. The antenna assembly of claim 22, wherein the shielding surface is a barrier rib.

25. The antenna assembly of claim 24, wherein the barrier rib includes an EMI (Electromagnetic interference) material.

26. The antenna assembly of claim 22, wherein the at least one antenna radiation unit includes first and second antenna conductors.

27. The antenna assembly of claim 26, wherein the first and second conductors are separated from each other until connecting together at a connection point.

28. A mobile terminal, comprising:
a wireless communication unit configured to wirelessly communicate with at least one other terminal;
a display configured to display information;
a printed circuit board;
at least one antenna radiation unit disposed next to the printed circuit board; and
a shielding surface disposed between the printed circuit board and the at least one antenna radiation unit so as to reduce an interference between the printed circuit board and the at least one antenna radiation unit,
wherein at least a portion of the shielding surface comprises a conductive material,
wherein the shielding surface is formed to be substantially perpendicular to the printed circuit board,
wherein the at least one antenna radiation unit includes first and second antenna conductors, and
wherein the first and second antenna conductors are separated from each other until connecting together at a connection point.

29. The mobile terminal of claim 28, wherein the printed circuit board has a rectangular shape and one side of the printed circuit board where the at least one antenna radiation unit is disposed is a shorter side of the rectangular shape.

30. The mobile terminal of claim 28, wherein the shielding surface is a barrier rib.

31. The mobile terminal of claim 30, wherein the barrier rib includes an EMI (Electromagnetic interference) material.

32. A mobile terminal, comprising:
a circuit board;
a ground plane;
a first conductive antenna and a second conductive antenna; and
a conductive wall disposed between the ground plane and the first antenna and between the ground plane and the second antenna,
wherein the conductive wall directly contacts the ground plane and is perpendicular to the first and the second antennas.

33. The mobile terminal of claim 32, wherein the circuit board has a rectangular shape and one side of the circuit board where the first and second conductive antennas are disposed is a shorter side of the rectangular shape.

34. The mobile terminal of claim 32, wherein the conductive wall includes an EMI (Electromagnetic interference) material.

35. The mobile terminal of claim 32, wherein the circuit board is installed in a first outer casing among two outer casings enclosing the circuit board and the first and second conductive antennas.

36. The mobile terminal of claim 32, wherein the first and second conductive antennas are separated from each other until connecting together at a connection point.

37. A mobile terminal, comprising:
a ground plane;
first and second antenna conductors disposed next to the ground plane;
a connecting portion configured to electrically connect the first and second antenna conductors to each other; and
a conductive wall disposed between the ground plane and the first antenna conductor and between the ground plane and the second antenna conductor,
wherein the conductive wall is formed to be substantially perpendicular to the ground plane.

38. The mobile terminal of claim 37, wherein the conductive wall directly contacts the ground plane.

39. The mobile terminal of claim 37, wherein the ground plane is disposed next to the conductive wall and spaced apart from the first and second antenna conductors with interposing the conductive wall therebetween.

40. The mobile terminal of claim 37, wherein the ground plane is disposed between the first and second antenna conductors.

41. The mobile terminal of claim 37, further comprising a printed circuit board having the ground plane at a predetermined region.

42. The mobile terminal of claim 37, wherein the conductive wall extends along the widthwise direction of the mobile terminal.

43. The mobile terminal of claim 37, wherein each of the first and second antenna conductors has a folded portion.

44. A mobile terminal, comprising:
a wireless communication unit configured to wirelessly communicate with at least one other terminal;
a display configured to display information;
a printed circuit board;
at least one antenna radiation unit disposed next to the printed circuit board; and
a shielding surface disposed between the printed circuit board and the at least one antenna radiation unit so as to reduce an interference between the printed circuit board and the at least one antenna radiation unit,
wherein at least a portion of the shielding surface comprises a conductive material,
wherein the shielding surface is formed to be substantially perpendicular to the printed circuit board, and
wherein the printed circuit board is installed in a first outer casing among two outer casings enclosing the printed circuit board and the at least one antenna radiation unit.
45. A mobile terminal, comprising:
a ground plane;
first and second antenna conductors disposed next to the ground plane;
a conductive wall disposed between the ground plane and the first antenna conductor and between the ground plane and the second antenna conductor; and
first and second housings enclosing the ground plane,
wherein the conductive wall is formed to be substantially perpendicular to the ground plane and is configured to protrude from the first or second housing.
46. A mobile terminal, comprising:
a ground plane;
first and second antenna conductors disposed next to the ground plane; and
a conductive wall disposed between the ground plane and the first antenna conductor and between the ground plane and the second antenna conductor; and
first and second housings enclosing the ground plane,
wherein the conductive wall is formed to be substantially perpendicular to the ground plane, and
wherein at least one of the first and second antenna conductors has a folded portion formed along an edge of the first or second housing.

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