

DESCRIPTION

ANTENNA FOR RADIO COMMUNICATION EQUIPMENT

5 TECHNICAL FIELD

The present invention relates to an antenna for radio communication equipment, and more particularly to an antenna for radio communication equipment which is preferable as an antenna for portable radio communication equipment or the like
10 required to be minimized, has high-flexibility in adjustment of impedance and a central frequency in a resonance system of an antenna even if a dimension of the antenna is under certain restrictions, and can flexibly be designed.

15 BACKGROUND ART

There has been used a small type of panel antenna such as a reversed L-type of or a reversed F-type of antenna which is small-sized and is suitable to be incorporated in portable equipment as an antenna for radio communication equipment, for
20 instance, radio equipment and a transceiver each mounted on a vehicle, and furthermore a cordless telephone set, mobile radio equipment or portable radio equipment each of which is growing in use for a general purpose.

Also, as improvement in the panel antennas, there has been
25 disclosed configuration of an antenna for radio communication equipment, in Japanese Patent Publication No. HEI 2-55961, which can easily match impedances, in other words, has high-flexibility in adjustment of antenna-impedance, and is well suited for size reduction even if a geometrical dimension
30 of a main component of the antenna and a position for taking

out a feeding point are restricted.

Fig. 7 schematically shows configuration of the conventional type of antenna applied to a cordless telephone set. In Fig. 7, the antenna in the example based on the conventional technology comprises a conductive main erecting surface section 711 with one edge thereof connected to a shield housing 730 which is a ground conductor and erecting to the other edge thereof by a height H ; a conductive main horizontal surface section 712 having a width W with one edge thereof connected to the other edge of the main erecting surface section 711, crossing the main erecting surface section 711 at right angles and horizontally extending to the other edge thereof by a length H ; a conductive auxiliary erecting linear section 713 with one edge thereof connected to the shield housing 730 via a feeding point 720, and linearly extending to the other edge thereof in parallel to the main horizontal surface section 712; a conductive auxiliary horizontal linear section 714 with one edge thereof connected to the other edge of the auxiliary erecting linear section 713, said conductive auxiliary horizontal linear section linearly extending, at a specified space to the main horizontal surface section 712, to the other edge thereof in parallel to the main horizontal surface section 712; a linking section 715 for electrically connecting the other edge of the auxiliary horizontal linear section 714 to a position of the other edge of the main horizontal surface section 712 or a position at a specified space from the position of the other edge thereof; a first conductor width section 716 having a width t_1 provided along the whole length or a portion of the length of the auxiliary horizontal linear section 714 and constituting a capacitor for adjusting impedance; and a

second conductor width section 717 having a width t_2 provided along a portion of the length of the auxiliary horizontal linear section 714 and constituting a capacitor for adjusting a central frequency.

5 In the antenna based on the conventional technology described above, impedance can be adjusted by (1) adjusting a distance between the auxiliary horizontal linear section 714 and the main horizontal surface section 712, (2) adjusting a position at which the auxiliary horizontal linear section 714
10 is connected to the main horizontal surface section 712 via the linking section 715, (3) adjusting a capacity according to a width t_1 and a length of the first conductor width section 716, and (4) adjusting a position of forming the second conductor width section 717 according to change in a longitudinal
15 direction of the auxiliary horizontal linear section 714.

Also, in a case where the second conductor width section 717 is provided right under the other edge of the main horizontal surface section 712 in which a voltage value becomes a maximum, a central frequency in a resonance system of the antenna can
20 be adjusted according to adjustment of the width t_2 and a dimension of the area.

In the conventional type of antenna for radio communication equipment as described above, a main erecting surface section and a ground conductor each connected to a
25 feeding point comprise a shield housing for shielding circuit components mounted on a printed board, so that restriction is added to the design that the upper edge surface portion of the shield housing facing to the main horizontal surface section should be formed in parallel to the main horizontal surface
30 section, which lowers the flexibility of the designing, and it

is difficult to uniformly form a ground potential surface facing to the main horizontal surface section and in parallel thereto.

Also, the auxiliary erecting linear section, auxiliary horizontal linear section, linking section, first conductor width section, and second conductor width section each one of
5 an antenna for radio communication equipment are formed on the printed board, so that, in designing an antenna as well as a printed board design, designing restrictions are added to each design, and for this reason, design flexibility as a whole radio
10 communication equipment is lowered.

Accordingly, the invention is made to solve the above-described problems and it is an object of the present invention to provide an antenna for radio communication equipment which has high designing flexibility and is excellent
15 in manufacturing workability because only an antenna therein can be designed independently from the other components by forming a ground potential surface in substantially parallel to the main horizontal surface section monolithically formed with the antenna.

Also, it is another object of the present invention to provide an antenna for radio communication equipment which can flexibly be designed because the antenna has high flexibility in adjustment of an impedance and a central frequency in a resonance system of the antenna even if dimensions of the
20 antenna are under certain restrictions.
25

Further, it is another further object of the present invention to provide an antenna for radio communication equipment in which components each constituting the antenna are monolithically formed, and an antenna can be designed
30 separately from other portions of the radio communication

equipment, so that high flexibility in designing can be achieved as a whole radio communication equipment.

DISCLOSURE OF INVENTION

5 The present invention enables impedance adjustment by adjusting a clearance between a main horizontal surface section and an auxiliary horizontal surface section, a length of the main horizontal surface section or auxiliary horizontal surface section and that of a connecting section (or a length of a
10 connecting section and that of a first extending section), by adjusting an area ratio of the main horizontal surface section vs. auxiliary horizontal surface section, or by adjusting a length of a second extending section, so that the present invention can provide an antenna for radio communication
15 equipment with a high degree of freedom in impedance adjustment.

 In the present invention, a ground potential surface as a ground horizontal surface section required to be substantially parallel to the main horizontal surface section is monolithically formed with other components of the antenna
20 for radio communication equipment, so that the antenna itself can independently be designed, and a freedom degree in designing the entire radio communication equipment is high, and further as the antenna is designed with a sheet of electrically conductive plate, so that an antenna for radio communication
25 equipment excellent in manufacturing workability can be provided.

 In the present invention, components of the antenna for radio communication equipment are provided all around a supporting section, so that it is possible to provide an antenna
30 for radio communication equipment which can easily be attached

to a housing for an antenna for radio communication equipment and is excellent in the workability.

BRIEF DESCRIPTION OF DRAWINGS

5 Figs. 1(a) to (d) are explanatory views schematically showing configuration of an antenna for radio communication equipment according to the present invention, Fig. 1(a) is an equivalent circuit thereof, Fig. 1(b) is a perspective view thereof, Fig. 1(c) is a perspective view when the antenna is
10 mounted on a supporting member shown in Fig. 1(b), and Fig. 1(d) is a perspective view showing another type of antenna; Figs. 2(a) to 2(e) are hexahedron views showing the antenna for radio communication equipment according to the present invention, Fig. 2(a) is a top view thereof, Fig. 2(b) is a rear view thereof,
15 Fig. 2(c) is a front view thereof, Fig. 2(d) is a left side view thereof, and Fig. 2(e) is a right side view thereof; Figs. 3(a) to 3(c) are explanatory views of construction when the antenna for radio communication equipment has been mounted on a housing, Fig. 3(a) is a bottom view thereof, Fig. 3(b) is a cross-
20 sectional side view thereof, and Fig. 3(c) is a top view thereof; Fig. 4 is an explanatory view for explanation of mounting the antenna for radio communication equipment onto the housing; Fig. 5 is a cross-sectional construction view for explanation of the housing construction of a radio section with the antenna for
25 radio communication equipment mounted thereon is incorporated into a frame; Fig. 6 is a characteristic explanatory view for explanation of adjustment of a central frequency in a resonance system of the antenna for radio communication equipment; and Fig. 7 is a view schematically showing configuration in which
30 the conventional type of antenna for radio communication

equipment is applied to a cordless telephone set.

BEST MODE FOR CARRYING OUT THE INVENTION

Detailed description is made hereinafter for outline and
5 embodiments of the antenna for radio communication equipment
according to the present invention with reference to the related
drawings in the order thereof.

Fig. 1 is explanatory view schematically showing
configuration of the antenna for radio communication equipment
10 according to the present invention, Fig. 1(a) is an equivalent
circuit, Fig. 1(b) is a perspective view thereof, Fig. 1(c) is
a perspective view showing is a case where the antenna shown
in Fig. 1(b) is mounted on the supporting member, and Fig. 1(d)
is a perspective view showing another type of antenna. Also,
15 Fig. 2 is a hexahedron view of the antenna shown in Fig. 1, Fig.
2(a) is a top view thereof, Fig. 2(b) is a rear view thereof,
Fig. 2(c) is a front view thereof, Fig. 2(d) is a left side view
thereof, and Fig. 2(e) is a right side view thereof.

The antenna for radio communication equipment according
20 to the fourth, fifth, and sixth features of the present
invention, as shown in Fig. 1(b) and Fig. 2, comprises a ground
horizontal surface section 121 for maintaining a ground
potential, a main erecting surface section 101 connected to and
crossing the ground horizontal surface section 121 at
25 substantially right angles for extending, a main horizontal
surface section 102 connected to and crossing the main erecting
surface section 101 at substantially right angles for extending,
an auxiliary erecting surface section 103 with one edge thereof
facing to a ground potential 120 via a feeding point 110 and
30 with the other edge thereof extending in substantially parallel

to the main erecting surface section 101, an auxiliary horizontal surface section 104 connected to the auxiliary erecting surface section 103 and extending at a specified space from the main horizontal surface section 102, a linking section
5 105 connected to the other edge of the main horizontal surface section 102 as well as to the other edge of the auxiliary horizontal surface section 104 and crossing each of the sections at substantially right angles for extending, and a second extending section 107 connected to and crossing the linking
10 section 105 at substantially right angles and extending in substantially parallel to the ground horizontal surface section 121.

In the antenna for radio communication equipment according to, especially, the fifth and sixth features of the
15 present invention, as shown in Fig. 1(c), in order to support the antenna by a supporting section 150 providing supporting side faces provided inside of a frame of a main body of the radio communication equipment, each component thereof is formed so that the main erecting surface section 101 and auxiliary
20 erecting surface section 103 face to a first side face of the supporting section 150, the main horizontal surface section 102 and auxiliary horizontal surface section 104 face to a second side face thereof, the linking section 105 faces to a third side face thereof, and the second extending section 107 faces to a
25 fourth side face thereof respectively.

Also in the antenna for radio communication equipment according to, especially, the sixth feature of the present invention, the ground horizontal surface section 121, main erecting surface section 101, main horizontal surface section
30 102, auxiliary erecting surface section 103, auxiliary

horizontal surface section 104, linking section 105, and second extending section 107 are monolithically formed with a sheet of conductive plate.

In the antenna for radio communication equipment according to the first, second, and third features of the present invention, as shown in Fig. 1(d), in a case where it corresponds to the antenna for radio communication equipment according to the fourth, fifth, and sixth features shown in Fig. 1(b), (c) and Fig. 2, respectively, it is assumed that the linking section 105 is so formed as to be connected to the other edge of the main horizontal surface section 102 as well as to the other edge of the auxiliary horizontal surface section 104 and as to extend in the same plain as the main and auxiliary horizontal surface sections, and that a section (linking section) indicated by the reference numeral 105 in Fig. 1(b), (c) and Fig. 2 is a first extending section 106.

The antenna for radio communication equipment according to the seventh feature of the present invention, among the components each shown in Fig. 1 and Fig. 2, comprises the ground horizontal surface section 121, main erecting surface section 101, main horizontal surface section 102, auxiliary erecting surface section 103, and auxiliary horizontal surface section 104, and further comprises, for instance, the linking section (corresponding to sections indicated by the reference numerals 105 and 106 in Fig. 1(d) respectively) connected to the other edge of the main horizontal surface section 102 as well as to the other edge of the auxiliary horizontal surface section 104, linking section so formed as to be present in a same plain as the main and auxiliary horizontal surface sections and to extend in a plain crossing the plain described above at right angles,

and the antenna for radio communication equipment according to the eighth feature is constructed by adding the first extending section (for instance, corresponding to a section indicated by the reference numeral 107 in Fig. 1(d)) to the antenna for radio communication equipment according to the seventh feature. It should be noted that the configuration shown in Fig. 1(b) is also one of embodiments according to the antenna for radio communication equipment according to the seventh and eighth features of the present invention.

With the configuration described above, in the antennas for radio communication equipment according to the first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, and tenth features of the present invention, impedance can be adjusted by (1) adjusting a specified space of the auxiliary horizontal surface section 104 to the main horizontal surface section 102, (2) adjusting a length of the main horizontal surface section 102 or the auxiliary horizontal surface section 104, or of the linking section 105 (or the linking section and the first extending section in the antennas for radio communication equipment according to the first, second, third, eighth, and ninth features of the present invention), and (3) adjusting an area ratio by the main horizontal surface section 102 as well as by the auxiliary horizontal surface section 104, and further in the antennas for radio communication equipment according to the first, second, third, fourth, fifth, sixth, and ninth features of the present invention, impedance can be adjusted by (4) adjusting a length of the second extending section 107.

Especially, in the antenna for radio communication equipment according to the ninth feature of the present

invention, a central frequency in a resonance system of the antenna can be adjusted by adjusting a length of the second extending section 107 or a dimension of an area thereof.

In the antennas for radio communication equipment according to the third, sixth, seventh, and eighth features of the present invention, as shown in Fig. 1 and Fig. 2, a ground potential surface to be in substantially parallel with the main horizontal surface section 102 is monolithically formed as the ground horizontal surface section 121 with other components in the antenna for radio communication equipment, so that only an antenna itself can be designed without giving any influence to a form design of a shield housing like that based on the conventional technology, whereby design flexibility as whole radio communication equipment can highly be achieved, and in addition, the antenna is monolithically formed with a sheet of conductive plate, and for this reason an antenna can be formed by simple manufacturing processes that, for instance, fold-forming is executed after press-forming, which makes it possible to realize an antenna for radio communication equipment excellent in manufacturing workability.

Furthermore, in the antennas for radio communication equipment according to the second, third, fifth and sixth features of the present invention, as shown in Fig. 1(c), components of the antenna for radio communication equipment are constructed by facing to four side faces of the supporting section 150 which is square in its cross section, so that the antenna for radio communication equipment can securely be fixed, and excellent workability in mounting work of the antenna for radio communication equipment can also be realized. Accordingly, the second extending section 107 has a function

of adjusting a central frequency and also has a function as a stopper.

In the antenna for radio communication equipment according to the tenth feature of the present invention, as shown in Fig. 1 and Fig. 4, the antenna for radio communication equipment is fixed with screws 401 and 402 with the second extending sections 121b, 121c of the ground horizontal surface section 121 and the printed board 301 held between upper and lower housings each covering the radio section of the radio communication equipment after the first extending section 121a of the ground horizontal surface section 121 is electrically connected by soldering or the like to a ground potential terminal of the printed board 301 on which circuit components of the radio section in the radio communication equipment are mounted and an extending section 103a of the auxiliary erecting surface section 103 to a terminal for input and output of transmitted and received signals of the printed board 301. With this feature, a work for mounting an antenna for radio communication equipment onto a housing becomes easier and simpler.

Fig. 3 shows the antenna 100 for radio communication equipment according to one of the embodiments of the present invention shown in Fig. 1(b), 1(c) and Fig. 2 applied to a PHS (Personal Handy Phone System) terminal unit and is a view for explanation of the configuration when the antenna for radio communication equipment is mounted on the shield housings 302, 303, and Fig. 3(a) is a bottom view thereof, Fig. 3(b) is a cross-sectional side view thereof, and Fig. 3(c) is a top view thereof.

In the PHS terminal unit, a request for size reduction

of a unit form is extremely high, but in the antennas 100 for radio communication equipment according to the embodiment of the present invention, as described above, impedance can be adjusted by (1) adjusting a distance between the auxiliary horizontal surface section 104 and the main horizontal surface section 102, (2) adjusting a length of the main horizontal surface section 102 or the auxiliary horizontal surface section 104, or the linking section 105, and (3) adjusting an area ratio of the main horizontal surface section 102 vs. the auxiliary horizontal surface section 104, and further by (4) adjusting a length of the second extending section 107, so that flexibility in adjusting impedance is extremely high, and for this reason it is possible that impedance can be designed to a desired value by adjustment in (1) to (4) described above even if there is any restriction for size reduction on the dimensional design for a height of the main erecting surface section 101 and auxiliary erecting surface section 103, or for a length of the main horizontal surface section 102 and auxiliary horizontal surface section 104.

20 In the configuration of the antenna based on the conventional technology, the ground conductor connected to the main erecting surface section and the feeding point is constructed with top surfaces of the upper and lower shield housings 302, 303 each shown in Fig. 3, so that it is difficult to form a ground potential surface facing to and uniformly in parallel to the main horizontal surface section 102 because actually the antenna has stages as shown in the figure or for some other reason, but in the antenna 100 for radio communication equipment according to the embodiment of the present invention, the ground horizontal surface section 121

in substantially parallel to the main horizontal surface section 102 is provided therein, and is monolithically formed with other components of the antenna for radio communication equipment, so that any such problem does not occur therein.

5 In design the antenna or a form of a shield housing, only the antenna itself can freely be designed without giving any restriction to other components, so that high designing flexibility as whole radio communication equipment can be achieved.

10 Fig. 4 is a view for explaining a structure for mounting the antenna 100 for radio communication equipment onto the shield housing. In the figure, designated at the reference numerals 401, 402 are mounting screws, at 301 a printed board on which circuit components of a radio section in a PHS terminal
15 unit are mounted, at 302 an upper side shield housing for covering the radio section, and at 303 a lower side shield housing.

When mounting the antenna 100 for radio communication equipment according to the embodiment of the present invention
20 onto the shield housing, at first, the first extending section 121a of the ground horizontal surface section 121 is electrically connected by soldering to a ground potential terminal of the printed board 301 and the extending section 103a of the auxiliary erecting surface section 103 to a terminal for
25 input and output of transmitted and received signals of the printed board 301 each to be temporarily fixed to the printed board 301. Then, the second extending sections 121b, 121c of the ground horizontal surface section 121 and the printed board 301 each in the antenna 100 for radio communication equipment
30 are fixed with the mounting screws 401 and 402 so that the two

sections and the board are held between the upper side shield housing 302 and the lower side shield housing 303 each covering the radio section of the radio communication equipment.

Fig. 5 is a cross-sectional construction view showing a PHS terminal unit when the housing of the radio section with the antenna 100 for radio communication equipment mounted thereon is incorporated in the frames 502, 503 of the PHS terminal unit.

As shown in the figure, the antenna 100 for radio communication equipment is supported by the supporting section 150 which is square in its cross section provided inside the frame 503, and is incorporated therein so that the peripheral four side faces of the supporting section 150 are covered with the components of the antenna 100 for radio communication equipment, and thus the main erecting surface section 101 and auxiliary erecting surface section 103 face to the first side face of the supporting section 150, the main horizontal surface section 102 and auxiliary horizontal surface section 104 face to the second side face thereof, the linking section 105 faces to the third side face thereof, and the second extending section 107 faces to the fourth side face thereof respectively. With this feature, the antenna 100 for radio communication equipment can securely be fixed to the PHS terminal unit.

As described above, the second extending section 107 has a function as a stopper for fixing the antenna 100 for radio communication equipment to the frame 503, and also can adjust a central frequency in a resonance of the antenna by adjusting a length and a dimension of an area of the second extending section 107.

In a case where, for instance, a length or a dimension

of an area of the second extending section 107 is set to an optimal value, it is assumed that a curve matching to the central frequency f_0 like the curve C0 indicated by the solid line shown in Fig. 6 can be obtained. In this case, when the length of the second extending section 107 is made shorter or the dimension of the area thereof is made smaller, the characteristics shifts to a higher frequency side as shown by the curve C2 indicated by a dotted line. Reversely, when the length of the second extending section 107 is made longer or the dimension of the area thereof is made larger, the characteristics is supposed to shift to a lower frequency side. Namely, in the antenna 100 for radio communication equipment according to the embodiment of the present invention, adjusting flexibility in a central frequency in a resonance system of the antenna can also be made higher.

As described above, with the antenna for radio communication equipment according to the first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, and tenth features of the present invention, impedance can be adjusted by adjusting a specified space of the auxiliary horizontal linear section to the main horizontal surface section, adjusting a length of the main horizontal surface section or the auxiliary horizontal surface section, or of the linking section (or the linking section and the first extending section), and adjusting an area ratio by the main horizontal surface section as well as by the auxiliary horizontal surface section, and further with the antennas for radio communication equipment according to the first, second, third, fourth, fifth, sixth, and ninth features of the present invention, impedance can be adjusted by adjusting a length of the second extending section,

so that it is possible to provide an antenna for radio communication equipment having extremely high flexibility in adjustment of impedance.

With the antenna for radio communication equipment according to the third, sixth, seventh, and eighth features of the present invention, the ground potential surface to be in substantially parallel with the main horizontal surface section is monolithically formed as a ground horizontal surface section with the other components in the antenna for radio communication equipment, so that only an antenna itself can be designed, whereby design flexibility as whole radio communication equipment can highly be achieved, and in addition, the antenna is monolithically formed with a sheet of conductive plate, which makes it possible to provide an antenna for radio communication equipment excellent in manufacturing workability.

With the antenna for radio communication equipment according to the second, third, fifth and sixth features of the present invention, the antenna is incorporated in the frame so that the four side faces of the supporting section are covered with the components of the antenna for radio communication equipment, which makes it possible to provide an antenna for radio communication equipment which can securely be fixed to a PHS terminal unit or the like.

With the antenna for radio communication equipment according to the ninth feature of the present invention, a central frequency in a resonance system of the antenna can be adjusted by adjusting a length of the second extending section or a dimension of an area thereof, so that it is possible to provide an antenna for radio communication equipment having also high flexibility in the central frequency.

Furthermore, with the antenna for radio communication equipment according to the tenth feature of the present invention, it is possible to provide an antenna for radio communication equipment excellent in workability because of
5 easier mounting work of the antenna onto housing.

INDUSTRIAL APPLICABILITY

As described above, the antenna for radio communication equipment according to the present invention is useful as a
10 communication antenna for portable radio equipment which has been required to be down-sized such as a vehicle-mounted radio equipment or a transceiver, or further for a cordless telephone set, movable radio equipment, or portable radio equipment widely used nowadays.

CLAIMS



1. An antenna for radio communication equipment comprising:
a ground horizontal surface section for maintaining a
5 ground potential;
a main erecting surface section having one edge thereof
connected to said ground horizontal surface section, crossing
said ground horizontal surface section at substantially right
angles and erecting to the other edge thereof;
10 a main horizontal surface section having one edge thereof
connected to said other edge of said main erecting surface
section, crossing said main erecting surface section at
substantially right angles, facing to and horizontally
extending in substantially parallel with said ground horizontal
15 surface section to the other edge thereof;
an auxiliary erecting surface section with one edge
thereof facing to the ground potential via a feeding point, said
section extending to the other edge thereof in substantially
parallel to said main erecting surface section;
20 an auxiliary horizontal surface section with one edge
thereof connected to said other edge of said auxiliary erecting
surface section, said auxiliary horizontal surface section
facing at a specified space from said main erecting surface
section to said ground horizontal surface section in
25 substantially parallel to each other and extending to the other
edge thereof in substantially parallel to said main horizontal
surface section;
a linking section with one edge thereof connected to said
other edge of said main horizontal surface section as well as
30 to said other edge of said auxiliary horizontal surface section,



said linking section present in a same plain as said main horizontal surface section and said auxiliary horizontal surface section and extending to the other edge thereof;

a first extending section with one edge thereof connected
5 to said other edge of said linking section, said first extending section crossing said linking section at substantially right angles and extending to the other edge thereof; and

a second extending section with one edge thereof connected to said other edge of said first extending section,
10 said second extending section crossing said first extending section at substantially right angles and extending to the other edge thereof in substantially parallel to said ground horizontal surface section.

15 2. An antenna for radio communication equipment according to claim 1 supported by a supporting section providing supporting side faces provided inside a frame for a main body of the radio communication equipment; wherein

said main erecting surface section and said auxiliary
20 erecting surface section face to a first side face of said supporting side face; said main ground horizontal surface section, said auxiliary horizontal surface section and linking section face to a second side face of said supporting side face; said first extending section faces to a third side face of said
25 supporting side face; and said second extending section faces to a fourth side face of said supporting side face respectively.

3. An antenna for radio communication equipment according to claim 1 or claim 2; wherein said ground horizontal surface
30 section, main erecting surface section, main horizontal surface



section, auxiliary erecting surface section, auxiliary horizontal surface section, linking section, first extending section, and second extending section are monolithically formed with a sheet of conductive plate.

5

4. An antenna for radio communication equipment comprising:

a ground horizontal surface section for maintaining a ground potential;

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a main erecting surface section having one edge connected to said ground horizontal section, crossing said ground horizontal surface section at substantially right angles and erecting to the other edge thereof;

a main horizontal surface section having one edge thereof connected to said other edge of said main erecting section surface, crossing said main erecting surface section at substantially right angles, facing to and horizontally extending in substantially parallel with said ground horizontal surface section to the other edge thereof;

20

an auxiliary erecting surface section with one edge section thereof facing to the ground potential via a feeding point, said section extending to the other edge thereof in substantially parallel to said main erecting surface section;

an auxiliary horizontal surface section with one edge thereof connected to said other edge of said auxiliary erecting surface section, said auxiliary horizontal surface section facing at a specified space from said main horizontal surface section to said ground horizontal surface section in substantially parallel to each other and extending to the other edge thereof in parallel to said main horizontal surface

30



section;

a linking section with one edge thereof connected to said other edge of said main horizontal surface section as well as to said other edge of said auxiliary horizontal surface section, said linking section crossing said main horizontal surface section and said auxiliary horizontal surface section at substantially right angles and extending to the other edge thereof; and

a second extending section with one edge thereof connected to said other edge of said linking section, said second extending section crossing said linking section at substantially right angles and extending to the other edge thereof in substantially parallel to said ground horizontal surface section.

15

5. An antenna for radio communication equipment according to claim 4 supported by a supporting section providing a supporting side face provided inside a frame for a main body of the radio communication equipment; wherein

said main erecting surface section and said auxiliary erecting surface section face to a first side face of said supporting side face; said main horizontal surface section and said auxiliary horizontal surface section face to a second side face of said supporting side face; said linking section faces to a third side face of said supporting side face; and said second extending section faces to a fourth side face of said supporting side face respectively.

6. An antenna for radio communication equipment according to claim 4 or claim 5; wherein said ground horizontal surface

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section, main erecting surface section, main horizontal surface section, auxiliary erecting surface section, auxiliary horizontal surface section, linking section, and second extending section are monolithically formed with a sheet of
5 conductive plate.

7. An antenna for radio communication equipment comprising:

a ground horizontal surface section for maintaining a
10 ground potential;

a main erecting surface section having one edge thereof connected to said ground horizontal surface section, said main erecting surface section crossing said ground horizontal surface section at substantially right angles and erecting to
15 the other edge thereof;

a main horizontal surface section having one edge thereof connected to said other edge of said main erecting surface section, said main horizontal surface section crossing said main erecting surface section at substantially right angles
20 and horizontally extending to the other edge thereof facing to and in substantially parallel with said ground surface horizontal surface section;

an auxiliary erecting section with one edge section thereof facing to the ground potential via a feeding point, said
25 section extending to the other edge thereof in substantially parallel to said main erecting surface section;

an auxiliary horizontal surface section with one edge thereof connected to said other edge of said auxiliary erecting surface section, said auxiliary horizontal surface section
30 facing at a specified space from said main horizontal surface



section to said ground horizontal surface section in substantially parallel to each other and extending to the other edge thereof in parallel to said main horizontal surface section;

5 a linking section with one edge thereof connected to said other edge of said main horizontal surface section as well as to said other edge of said auxiliary horizontal surface section; wherein said ground horizontal surface section, main erecting surface section, main horizontal surface section, auxiliary
10 erecting section, auxiliary horizontal section and linking section are monolithically formed with a sheet of conductive plate.

8. An antenna for radio communication equipment according
15 to claim 7; wherein said linking section crosses said main horizontal surface section and said auxiliary horizontal surface section at substantially right angles, is monolithically formed with said conductive plate, and further has a second extending section having one edge thereof connected
20 to said other edge of said linking section and extending in substantially parallel with said ground horizontal surface section to the other edge thereof.

9. An antenna for radio communication equipment according
25 to any of claims 1, 2, 3, 4, 5, or 6; wherein a central frequency in a resonance system of said antenna for radio communication is adjusted according to change in a length of said second extending section up to said other edge or in an area of said second extending section.



10. An antenna for radio communication equipment according to any of claims 1, 2, 3, 4, 5, 6 or 9; wherein said antenna for radio communication equipment is connected to a base plate on which circuit components of a radio section in radio communication equipment are mounted, and said antenna for radio communication equipment is fixed with the second extending section of said ground horizontal surface section and said base plate held between upper and lower housings each covering the radio section of the radio communication equipment after the first extending section of said ground horizontal surface section is electrically connected to a ground potential terminal of said base plate and the extending section of said auxiliary erecting surface section to a terminal for input and output of transmitted and received signals of said base plate.