

TITLE OF INVENTION: SYSTEM ARCHITECTURE FOR UNMANNED VEHICLE ANTENNA TO SUPPRESS ENEMY INTERFERENCE AND ENHANCE OUR SIGNAL STRENGTH

BACKGROUND OF THE INVENTION

5 1. Field of the Invention:

An invention relates to an unmanned vehicle antenna, especially to one that suppresses enemy interference and enhances our signal strength.

2. Description of the Related Art:

First, an antenna is a device used to transmit or receive radio waves (RF). It
10 radiates signals outward or receives signals in as electromagnetic waves. During transmission, the transmitter applies current to the antenna, and the applied time-varying voltage or time-varying current generates a radiated electromagnetic field, which converts the energy of the current into radio waves. When receiving, the antenna will generate a time-varying current inside the antenna due to the
15 induction of the electric field, and generates a time-varying voltage, the generated electrical signal can be observed or heard in the receiver after processing. Nowadays, antennas have been widely used in communication systems of unmanned vehicles.

Second, the antenna is usually connected to a radio transmitter or receiver
20 to transmit or receive radio waves in an "omnidirectional" or "directional" manner, as a component to guide the direction of radio waves. Currently, most unmanned vehicles use omnidirectional antennas because they can radiate evenly in a plane. Omnidirectional antennas are very easy to install, and because they

have a 360-degree horizontal field pattern, they can even be installed upside down on the unmanned vehicles.

However, the unmanned vehicles are operated by remote control, so the signal reception of the omnidirectional antenna (Omni Antenna) on the unmanned vehicle becomes particularly important. Referring to FIG. 1A, it discloses a schematic diagram of a conventional unmanned boat 10 and an omnidirectional antenna (Omni Antenna) 20 thereon. Referring to FIG. 1B, central station of our side (O) communicates and controls through the omnidirectional antenna 20 on the unmanned vehicle 10. Since the omnidirectional antenna 20 has a 360-degree horizontal field, when the unmanned vehicle 10 approaches the enemy, the enemy will use a signal jammer to interfere. Therefore, the unmanned vehicle 10 is unable to receive signal of our ends, and the connection with central station of our side is interrupted, and even the unmanned vehicle 10 may be occupied by the enemy.

15 SUMMARY OF THE INVENTION

A primary objective of the present invention is to provide a system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength, which suppresses enemy interference and enhances our signal strength.

20 Another objective of the present invention is to provide a system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength, which has the effect of improving the radiation efficiency of unmanned vehicle antennas, effectively expanding the coverage of antennas, and improving communication quality.

In order to achieve the above objective, the present invention includes: an unmanned vehicle having at least one omnidirectional antenna arranged on a body surface thereof; when the unmanned vehicle is in the "forward" state, a metal plate erect in front of the omnidirectional antenna to prevent enemy interference signals without blocking the rear of the omnidirectional antenna; and when the unmanned vehicle is in the "return" state, the metal plate **30** erect behind the omnidirectional antenna to prevent enemy interference signals; The metal plate is provided with numerous air circulation holes, which can reduce the wind resistance of the unmanned vehicle when it is moving. Furthermore, in addition to suppressing enemy interference signals, the metal plate also is an enhancement plate for the radiation signal since it is grounded together with the omnidirectional antenna, thereby improving the antenna radiation efficiency of the unmanned vehicle, effectively expanding the coverage range of the antenna, and enhancing the quality of communication with our side.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a schematic diagram illustrating the conventional unmanned boat with antenna;

FIG. 1B is a schematic diagram illustrating the conventional unmanned boat being affected by signal interference;

FIG. 2 is a prospective view of the first embodiment of the present invention;

FIG. 3A is a zoom in view of the main structure of the first embodiment of the present invention, which discloses the first metal plate blocking in front of the omnidirectional antenna;

FIG. 3B is a zoom in view of the main structure of the first embodiment of the present invention, which discloses the first metal plate blocking behind the omnidirectional antenna;

FIG. 4A is a sectional view of the first embodiment of the present invention,
5 which discloses the first metal plate blocking in front of the omnidirectional antenna;

FIG. 4B is a sectional view of the first embodiment of the present invention, which discloses the first metal plate blocking behind the omnidirectional antenna;

FIG. 5A is a schematic diagram illustrating the application of the first
10 embodiment of the present invention in forward state;

FIG. 5B is a schematic diagram illustrating the application of the first embodiment of the present invention in return state;

FIG. 6A is a prospective view of the first metal plate of the present invention;

FIG. 6B is a prospective view of the first metal plate of the present invention;

15 FIG. 6C is a prospective view of the first metal plate of the present invention;

FIG. 7 is a block diagram illustrating the main structure of the present invention;

FIG. 8 is a block diagram illustrating the control steps of the present invention;

20 FIG. 9A is an exploded prospective view of the second embodiment of the present invention;

FIG. 9B is an assembly prospective view of the second embodiment of the present invention;

FIG. 10A is a sectional view along line 10A-10A in FIG. 9B, which discloses the erected metal plate blocking the front of the omnidirectional antenna;

FIG. 10B is a sectional view, which discloses the erected metal plate blocking the rear of the omnidirectional antenna;

5 FIG. 11 is a sectional view along line 11-11 in FIG. 10A;

FIG. 12 is a block diagram illustrating the main structure of the second embodiment of the present invention;

FIG. 13 is a block diagram illustrating the control steps of the second embodiment of the present invention.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 2-8, the first embodiment the present invention includes: an unmanned vehicle **10** having at least one omnidirectional antenna **20** arranged on a body surface **11** thereof; a control module **60**, arranged on the unmanned vehicle **10**, for controlling a power source **63** to drive the unmanned vehicle **10**,
15 the power source **63** includes a motor, an engine, etc.; the control module **60** coupled to a communication module **61** and the omnidirectional antenna **20** to control the operation of the unmanned vehicle **10**; a power supply module **64**, used to provide power required by the unmanned vehicle **10** and various devices thereon. However, the omnidirectional antenna **20**, control module **60** and the
20 power source **63** belong to prior art, so will not be disclosed in detailed here. In the following embodiment, the symbol “F” stands for the front side of the omnidirectional antenna **20**, which is also the front side of the unmanned vehicle **10**; the symbol “R” stands for the rear side of the omnidirectional antenna **20**,

which is also the rear side of the unmanned vehicle **10**.

The main feature of the present invention is: the omnidirectional antenna **20** is vertically arranged on the surface of the body surface **11**, and its bottom is electrically connected to a grounding interface **40** with a signal feed end **21**; In
5 this embodiment, the grounding interface **40** is in the form of a metal plate, but is not limited thereto, and may also be a metal contact or a connecting wire. The signal feed end **21** is an existing structure of the omnidirectional antenna **20**, and is the connection point between the coaxial cable **22** and the omnidirectional antenna **20**, and the coaxial cable **22** is electrically connected to the
10 communication module **61**.

A first metal plate **30F**, arranged in front of the omnidirectional antenna **20**, a plurality of first air circulation holes **31f** are arranged on the plate surface, and a first grounding wire **32f** is arranged at the bottom, and the other end of the first grounding wire **32f** is electrically connected to the grounding interface **40** so that
15 the first grounding wire **32f** and the omnidirectional antenna **20** form a common grounding state.

A second metal plate **30R**, arranged behind of the omnidirectional antenna **20**, a plurality of second air circulation holes **31r** are arranged on the plate surface, and a second grounding wire **32r** is arranged at the bottom, and the other end of
20 the second grounding wire **32r** is electrically connected to the grounding interface **40** so that the second grounding wire **32r** and the omnidirectional antenna **20** form a common grounding state.

In this embodiment, the first metal plate **30F** and the second metal plate **30R**

has the same structure, as FIG 6A showing, include a flat body (**30a**), but not limit to this. Or as FIG. 6B showing, include a V-shaped body (**30b**). Or as FIG. 6C showing, include an arc-shaped body or other shapes. Furthermore, the metal plate mentioned here includes a whole metal plate, or a non-metal plate composite, or a plated metal, all of which are applicable.

Moreover, no matter forming in what kinds of shape, the first metal plate **30F** and the second metal plate **30R** are provided with numerous first air circulation holes **31f** and second air circulation holes **31r**, for reducing the wind resistance of the unmanned vehicle when it is moving.

Referring to FIG. 3A and FIG. 4A, a first braking module **50F**, comprising a first brake unit **51f** for connecting to the first metal plate **30F**, a first positioning unit **52f** for positioning the first brake unit **51f**, and a first driving source **53f** set on a side of the first positioning unit **52f** for driving the first brake unit **51f** so that the first metal plate **30F** is erected to block at the front of the omnidirectional antenna **20**, or as showing FIG. 3B and FIG. 4B is folded on the body surface **11** so that there is no obstruction in front of the omnidirectional antenna **20**.

Referring to FIG. 3B and FIG. 4B, a second brake module **50R**, which has the same structure as first braking module **50F**, symmetrically arranged on the corresponding sides; it comprising a second brake unit **51r** for connecting to the second metal plate **30R**, a second positioning unit **52r** for positioning the second brake unit **51r**, and a second driving source **53r** set on a side of the second positioning unit **52r** for driving the second brake unit **51r** so that the second metal plate **30R** is erected to block the rear of the omnidirectional antenna **20**, or as

showing FIG. 3A and FIG. 4A is folded on the body surface **11** so that there is no obstruction behind the omnidirectional antenna **20**;

In this embodiment, the first driving source **53f** and second driving source **53r** include a motor, but not limit to this. They can also be composed by a rotary
5 cylinder or a pneumatic cylinder. The main function of the driving source is to drive the first brake unit **51f** and second brake unit **51r** to rotate, thereby causing the first metal plate **30F** and second metal plate **30R** to flip about 90 degrees on the body surface **11**.

Therefore, in a preferred embodiment, the first brake unit **51f** and second
10 brake unit **51r** of the first brake module **51F** and second brake module **51R** are a shaft rod, which is laterally connected to the bottom of the first metal plate **30F** and the second metal plate **30R**, and the first positioning unit **52f** and second positioning unit **52r** are a set of parallel shaft seats to support the shaft rod, the first driving source **53f** and second driving source **53r** are arranged on the sides
15 of the shaft seats and drive the first brake unit **51f** and second brake unit **51r** to rotate forward or reverse.

Furthermore, the first braking module **50F** and the second brake module **50R** disclose that the first metal plate **30F** and the second metal plate **30R** are rotated with 90 degrees to block or not block the omnidirectional antenna **20**, but not
20 limit to this. For example, when the unmanned vehicle **10** has a larger internal space, the first braking module **50F** and the second brake module **50R** can drive the first metal plate **30F** and the second metal plate **30R** to erect on the body surface **11** to block the front or rear of the omnidirectional antenna **20**, and when

folded, they are lowered to the internal space of the unmanned vehicle **10**.

Referring to FIG. 7, the control module **60** further includes a navigation sensor module **62** electrically connected to the first brake module **50F** and second brake module **50R**, wherein the navigation sensor module **62** is used to provide
5 information on the position and travel direction of the unmanned vehicle **10**; also, referring to the FIG. 8, the control steps of the first embodiment include:

S100: providing a first metal plate **30F** and a second metal plate **30R**;

S110: providing a navigation sensing module **62**;

S120: determine whether the unmanned vehicle **10** is "forward" or "return";

10 S130: when the navigation sensing module **62** senses the unmanned vehicle **10** is in "forward" state, the first brake module **50F** drives the first brake unit **51f** to make the first metal plate **30F** erect in front of the omnidirectional antenna **20** to prevent enemy interference signals; at the same time, the second brake module **50R** drives the second brake unit **51r** to make the second metal plate **30R** lie flat
15 on the body surface **11** in a folded state without blocking the rear of the omnidirectional antenna **20**;

S140: when the navigation sensor module **62** senses that the unmanned vehicle **10** is in the "return" state, the first brake module **50F** drives the first brake unit **51f** to make the first metal plate **30F** lie flat on the body surface **11** in a
20 folded state without blocking the front of the omnidirectional antenna **20**; at the same time, the second brake module **50R** drives the second brake unit **51r** to make the second metal plate **30R** erect behind the omnidirectional antenna **20** to

prevent enemy interference signals.

In this embodiment, the length of the omnidirectional antenna **20** is 1/4 of its wavelength (λ). Due to the basic principle of antenna transmission, electricity transmission in a conductor at a speed close to the speed of light, and when it
5 encounters a discontinuity in the conductor, it is reflected back to the signal source. If the current is alternating and the reflected current returns to the origin or feed point at the right moment, the current will be strengthened by the subsequent cycles, so that only a small amount of energy is required to maintain the standing wave in the antenna, that is, the existence of the standing waves puts
10 the antenna in a resonant state, thereby emitting radio waves into space. According to the principle and experiments of transmission, when the length of the antenna is 1/4 of the wavelength of the radio signal, the transmission and reception conversion efficiency of the antenna is higher. Compared with half wavelength and full wavelength, the antenna size is much smaller. In comparison,
15 the ratio of antenna transmission and receiving efficiency to antenna size is the highest, so quarter-wavelength antennas are often used.

As mentioned above, the length of the omnidirectional antenna **20** is 1/4 of its wavelength (λ), and the height of the first metal plate **30F** and the second metal plate **30R** is the same as or higher than the length of the omnidirectional
20 antenna **20**. Therefore, the interference signal to the omnidirectional antenna **20** by the enemy can be prevented.

Referring to FIGS. 9A~13, which disclosed the second embodiment, the same units as first embodiment are marked with same number and symbol, the

differences are: The metal plate of the first embodiment has two front and rear pieces, including a first metal plate **30F** and a second metal plate **30R**, while the metal plate of the second embodiment has only one piece, that is, an erected metal plate **30**, the erected metal plate **30** includes a flat body (**30a**), a V-shaped body
5 (**30b**), an arc-shaped body (**30c**) or other shapes. This embodiment uses the arc-shaped body (**30c**) for example. Moreover, in the second embodiment only requires one brake module **50** to move the erected metal plate **30** to the front side or rear side of the omnidirectional antenna **20**.

Therefore, in the second embodiment, the main structure includes: an
10 erected metal plate **30**, arranged at the periphery of the omnidirectional antenna **20**, a plurality of air circulation holes **31** are arranged on the plate surface, and a grounding wire **32** is arranged at the bottom, and the other end of the grounding wire is electrically connected to the grounding interface **40** so that the grounding wire **32** and the omnidirectional antenna **20** form a common grounding state; a
15 brake module **50**, comprising a brake unit **51** for connecting to the erected metal plate **30**, a positioning unit **52** for positioning the brake unit **51**, and a driving source **53** set on a side of the positioning unit **52** for driving the brake unit **51** so that the erected metal plate **30** is erected to block the rear or the front of the omnidirectional antenna **20**; also, referring to the FIG. 12, the control module **60**
20 further includes a navigation sensor module **62** electrically connected to the brake module **50**; Referring to the FIG. 13, the control steps of the second embodiment include:

S200: providing an erected metal plate **30**;

S210: providing a navigation sensing module **62**;

S220: determine whether the unmanned vehicle **10** is “forward” or “return”;

S230: when the navigation sensing module **62** senses the unmanned vehicle **10** is in “forward” state, the brake module **50** drives the brake unit **51** to make
5 the erected metal plate **30** erect in front of the omnidirectional antenna **20** to prevent enemy interference signals without blocking the rear of the omnidirectional antenna **20**;

S240: when the navigation sensor module **62** senses that the unmanned vehicle **10** is in the "return" state, the brake module **50** drives the brake unit **51**
10 to make the erected metal plate **30** erect behind the omnidirectional antenna **20** to prevent enemy interference signals.

In a preferred embodiment, the erected metal plate **30** is an arc-shaped body, and the two sides of the arc-shaped body do not exceed the 180 degree line.

In a preferred embodiment, the brake unit **51** of the brake module **50** is a
15 ring gear, the bottom of the erected metal plate **30** is connected to the upper edge of the ring gear, the positioning unit **52** is an annular groove for supporting the ring gear to rotate thereon, the driving source **53** is arranged on the side of the annular groove, and a small gear **532** which meshes with the ring gear is provided on its axis **531** and drives the ring gear to rotate forward or reverse. Moreover, in
20 this embodiment, the ring gear includes an internal ring gear, but not limit to this. The ring gear can also be an external ring gear, the driving source **53** and the small gear **532** set on the outer periphery of the external ring gear and mesh with the external ring gear.

Therefore, both first and second embodiments have the effect of suppressing enemy interference and enhancing our signal strength.

With the features disclosed above, the present invention has below effects:

1. When the unmanned vehicle **10** is in the "forward" state, a metal plate
5 erect in front of the omnidirectional antenna to prevent enemy interference signals without blocking the rear of the omnidirectional antenna; and when the unmanned vehicle **10** is in the "return" state, the metal plate erect behind the omnidirectional antenna to prevent enemy interference signals.

2. The metal plate is provided with numerous air circulation holes, which
10 can reduce the wind resistance of the unmanned vehicle when it is moving.

3. In addition to suppressing enemy interference signals, the metal plate also
is an enhancement plate for the radiation signal since it is grounded together with
the omnidirectional antenna **20**, thereby improving the antenna radiation
efficiency of the unmanned vehicle **10**, effectively expanding the coverage range
15 of the antenna, and enhancing the quality of communication with our side.

Although particular embodiments of the invention have been described in
detail for purposes of illustration, various modifications and enhancements may
be made without departing from the spirit and scope of the invention.
Accordingly, the invention is not to be limited except as by the appended claims.

20

What Is Claimed Is:

1. A system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength, includes:

an unmanned vehicle having at least one omnidirectional antenna arranged
5 on a body surface thereof;

a control module, arranged on the unmanned vehicle, for controlling a power source to drive the unmanned vehicle, and the control module is coupled to a communication module and the omnidirectional antenna to control the unmanned vehicle; and

10 a power supply module, used to provide power required by the unmanned vehicle and various devices thereon;

wherein

the omnidirectional antenna is vertically arranged on the surface of the body surface, and its bottom is electrically connected to a grounding interface with a
15 signal feed end connected to a coaxial cable;

a first metal plate, arranged in front of the omnidirectional antenna, a plurality of first air circulation holes are arranged on the plate surface, and a first grounding wire is arranged at the bottom, and the other end of the first grounding wire is electrically connected to the grounding interface so that the first
20 grounding wire and the omnidirectional antenna form a common grounding state;

a second metal plate, arranged behind of the omnidirectional antenna, a plurality of second air circulation holes are arranged on the plate surface, and a

second grounding wire is arranged at the bottom, and the other end of the second grounding wire is electrically connected to the grounding interface so that the second grounding wire and the omnidirectional antenna form a common grounding state;

5 a first braking module, comprising a first brake unit for connecting to the first metal plate, a first positioning unit for positioning the first brake unit, and a first driving source set on a side of the first positioning unit for driving the first brake unit so that the first metal plate is erected to block at the front of the omnidirectional antenna, or is folded on the body surface so that there is no
10 obstruction in front of the omnidirectional antenna;

 a second brake module, comprising a second brake unit for connecting to the second metal plate, a second positioning unit for positioning the second brake unit, and a second driving source set on a side of the second positioning unit for driving the second brake unit so that the second metal plate is erected to block
15 the rear of the omnidirectional antenna, or is folded on the body surface so that there is no obstruction behind the omnidirectional antenna;

 the control module further includes a navigation sensor module electrically connected to the first brake module and second brake module, wherein the navigation sensor module is used to provide information on the position and
20 travel direction of the unmanned vehicle;

 First, when the navigation sensor module senses that the unmanned vehicle is in the "forward" state, the first brake module drives the first brake unit to make the first metal plate erect in front of the omnidirectional antenna to prevent enemy

interference signals; at the same time, the second brake module drives the second brake unit to make the second metal plate lie flat on the body surface in a folded state without blocking the rear of the omnidirectional antenna; and

Next, when the navigation sensor module senses that the unmanned vehicle
5 is in the "return" state, the first brake module drives the first brake unit to make the first metal plate lie flat on the body surface in a folded state without blocking the front of the omnidirectional antenna; at the same time, the second brake module drives the second brake unit to make the second metal plate erect behind the omnidirectional antenna to prevent enemy interference signals.

10 2. The system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength as claimed in claim 1, wherein the grounding interface includes a metal plate, a metal contact, or a connecting wire.

3. The system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength as claimed in claim 1, wherein the
15 first driving source and second driving source include a motor, a rotary cylinder or a pneumatic cylinder.

4. The system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength as claimed in claim 1, wherein the length of the omnidirectional antenna is $1/4$ of its wavelength (λ).

20 5. The system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength as claimed in claim 1, wherein the first metal plate and the second metal plate include a flat body, a V-shaped body, and an arc-shaped body.

6. The system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength as claimed in claim 4, wherein the first brake unit and second brake unit of the first brake module and second brake module are a shaft rod, which is laterally connected to the bottom of the first metal plate and the second metal plate, and the first positioning unit and second positioning unit are a set of parallel shaft seats to support the shaft rod, the first driving source and second driving source are arranged on the sides of the shaft seats and drive the shaft rod to rotate forward or reverse.

7. A system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength, includes:

an unmanned vehicle having at least one omnidirectional antenna arranged on a body surface thereof;

a control module, arranged on the unmanned vehicle, for controlling a power source to drive the unmanned vehicle, and the control module is coupled to a communication module and the omnidirectional antenna to control the unmanned vehicle; and

wherein

the omnidirectional antenna is vertically arranged on the surface of the body surface, and its bottom is electrically connected to a grounding interface with a signal feed end;

an erected metal plate, arranged at the periphery of the omnidirectional antenna, a plurality of air circulation holes are arranged on the plate surface, and

a grounding wire is arranged at the bottom, and the other end of the grounding wire is electrically connected to the grounding interface so that the grounding wire and the omnidirectional antenna form a common grounding state;

5 a brake module, comprising a brake unit for connecting to the metal plate, a positioning unit for positioning the brake unit, and a driving source set on a side of the positioning unit for driving the brake unit so that the erected metal plate is erected to block the rear or the front of the omnidirectional antenna;

the control module further includes a navigation sensor module electrically connected to the brake module, wherein the navigation sensor module is used to
10 provide information on the position and travel direction of the unmanned vehicle;

First, when the navigation sensor module senses that the unmanned vehicle is in the "forward" state, the brake module drives the brake unit to make the erected metal plate erect in front of the omnidirectional antenna to prevent enemy interference signals without blocking the rear of the omnidirectional antenna; and

15 Next, when the navigation sensor module senses that the unmanned vehicle is in the "return" state, the brake module drives the brake unit to make the erected metal plate erect behind the omnidirectional antenna to prevent enemy interference signals.

8. The system architecture for unmanned vehicle antenna to suppress enemy
20 interference and enhance our signal strength as claimed in claim 7, wherein the erected metal plate is an arc-shaped body, and the two sides of the arc-shaped body do not exceed the 180 degree line.

9. The system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength as claimed in claim 8, wherein the brake unit of the brake module is a ring gear, the bottom of the erected metal plate is connected to the upper edge of the ring gear, the positioning unit is an annular groove for supporting the ring gear to rotate thereon, the driving source is arranged on the side of the annular groove, and a small gear which meshes with the ring gear is provided on its axis and drives the ring gear to rotate forward or reverse.

10. The system architecture for unmanned vehicle antenna to suppress enemy interference and enhance our signal strength as claimed in claim 9, wherein the ring gear includes an internal ring gear or an external ring gear.