

Description

BACKGROUND OF THE INVENTION

The field of this invention is the identification of remote objects, often moving objects. In the past, this has been accomplished by the transmission of an r-f signal to a remote tag. The tag contains the electronic identity of the object, or other information. The tag is a powered antenna which serves to modulate and reflects the transmitted beam. The reflected modulated beam is received at the transmitter where the information from the tag is decoded. Systems of this type are described in U.S. Patents Nos. 4,075,632 and 4,816,839 and Patent Application EP 0 253 368.

In the past there have been two kinds of tags: one is battery powered and the other is powered by the transmitted beam. Battery powered tags have the disadvantage of required periodic battery or tag replacement. Moreover, occasionally a battery will be come inoperative much earlier than normal, leaving the remote object with no means of being identified.

U.S. standard frequency for transmitted microwave signals for industrial, scientific and medical uses (ISM), the one used for remote object identification require, is a center frequency of 915 MHz. At this frequency, it has been possible to develop a tag powered by the beam alone without a battery. However, various other countries, such as Japan and France, legislate an ISM microwave center frequency much higher, above 2000 MHz. In Japan and France, the ISM standard is 2450 MHz. For reasons which will be explained, it has been impossible to develop an antenna at that frequency capable of a reasonable transmission range, in excess of 1 meter, which does not require battery power.

Without battery power, the antenna must collect its transmission energy solely from the transmitted signal, thus obtaining sufficient output power to run the modulator circuit. The modulator circuit modulates the antenna backscatter cross-section and reflects the resultant signal to the transmitter in order to communicate the circuit's unique identification code (a digitally stored number).

The maximum power available at the antenna is governed by two factors. The power is equal to the effective aperture (A) of the antenna multiplied by the power density incident on antenna in watts per square meter. The size of the effective aperture A is inversely proportional to the square of the frequency of the transmitted microwave signal. Thus, the higher the transmitted frequency, the smaller the aperture. However, the transmitted frequency, as discussed earlier, is fixed by regulation. The frequency may not vary significantly from a prescribed value of 2450 MHz in Japan and France or 915 MHz in the United States. Moreover, in Japan, the maximum transmitted power is only 0.3 watts in comparison to a power

in excess of 2 watts in the United States. For both of these reasons, the available power at the antenna in Japan or France is greatly reduced from that available in the United States.

As an additional complication, as the transmitted frequency gets higher, the parasitics of the antenna circuit elements in the antenna become much more critical. The choice of microwave diode is very critical. Tuning the circuit also becomes more difficult.

As a result, for use in countries employing the high frequency standard, tags have required batteries to provide sufficient power to achieve the desired minimum transmission ranges of at least 2 meters.

The possibility has been considered of using a phased array of multiple antennas to increase the gain, and thus the effective aperture and the output power. However, phased arrays are undesirable in many applications because they make the antenna too directional.

Folded dipole antennas were also considered, but they were thought to be inadequate because the impedance of a folded dipole antenna would be too high compared with the parasitic impedances of the microwave diodes used for conversion of r-f to d.c. The parasitic impedance of the microwave diode forms a voltage divider with the antenna impedance, and that divides the power and reduces the power delivered to the output. Such folded dipole antennas have previously been used at microwave frequencies (2450 MHz) for checking stray, undesirable transmission from microwave ovens. However, such a checker is located only a few inches from the source of microwave energy and the transmission levels sought to be detected thus were relatively high, on the order of 5 milliwatts per square centimeter. Therefore the antenna parasitics were not at all critical. The available power at such a short range was adequate even if substantial power were lost as a result of the parasitics.

In the present invention, the beam power used to power the antenna is very low, more than two orders of magnitude less than the power outside of any microwave oven which even marginally exceeds regulation (the ones which require the generation of an output "danger" signal from the antenna). Therefore, what is required is a low antenna impedance and a high diode parasitic impedance, thereby maximizing the voltage across the diode and thus the output power. Accordingly, folded dipole antennas were ruled out.

BRIEF DESCRIPTION OF THE INVENTION

Unexpectedly, it was discovered that by combination of a ground plane, critically placed with respect to the antenna, the impedance of a folded dipole antenna could be reduced sufficiently to significantly increase the power out from the antenna. By combining

this antenna impedance decrease with careful selection of an output diode having a high impedance, the output power was dramatically increased.

In a preferred embodiment of the invention, two or more of these antennas are series d.c. coupled to further increase antenna power. By using d.c. coupling as opposed to phased arrays, the undesirable directionality is not increased.

According to the invention there is provided an antenna for receiving and modulating transmitted signals having very low power density at the antenna on the order of below about 1 watt per meter squared, at a selected center frequency above 2000 MHz, comprising:

a folded planar dipole section having two separated oppositely disposed U-shaped elements (1,2), each of said elements having a pair of ends;

a capacitor (4) series coupled between two oppositely disposed ends of said two elements (1,2);

a diode (3) having a predetermined impedance at said selected center frequency, series coupled between the other two oppositely disposed ends of said two elements (1,2);

a metallic backplane mounted parallel to said planar folded dipole section and spaced therefrom by a predetermined distance selected to reduce the antenna impedance, the impedance of said diode (3), the shape of said folded planar dipole section and the predetermined amount of spacing of said backplane from said planar folded dipole section all being selected to increase the d.c. power output of the antenna across the capacitor (4).

In a preferred embodiment of the invention, two or more dipole sections can be connected in d.c. series. Moreover, the capacitor may be selected to have a low impedance at the center frequency of the transmitted signal. In addition, a matching section may be connected between the folded dipole section and the diode in order to better match the impedance of the diode to the impedance of the antenna.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a plan view of the folded dipole section, shown somewhat in schematic, of the antenna of one embodiment of the invention.

FIGURE 2 is a plan view of the folded dipole section, shown somewhat in schematic, of the antenna of another embodiment of the invention.

FIGURE 3 is a plan view of the folded dipole section, shown somewhat in schematic, of the antenna of a preferred embodiment of the invention.

FIGURE 4 is a cross-sectional view showing the mounting of the folded dipole section of the antenna of this invention spaced from the metallic backplane.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGURE 1, the dipole antenna of the invention is comprised of two U-shaped elements 1 and 2, disposed opposite each other as shown. Diode 3 is connected in series between two oppositely disposed ends of U-shaped elements 1 and 2, as shown. Diode 3 has a high impedance, preferably above about 100 ohms, at the selected center frequency. As discussed above, for use in Japan or France, the selected center frequency is 2450 MHz. Diodes operating at this frequency are preferably Schottky diodes, for example Schottky diode HSCH-6330 manufactured by Hewlett Packard Company.

Capacitor 4 is series-coupled between the other two oppositely disposed ends of U-shaped elements 1 and 2, as shown. This capacitor is selected to have a low impedance at the selected center frequency. A capacitor which operates well is No. 2100722, 22 picofarads at 50 volts, manufactured by Mouser Capacitor Division in Taiwan.

The antenna of the invention receives a signal, such as the 2450 MHz signal which has been described. This signal causes currents to flow on both elements 1 and 2. These currents flow unimpeded through capacitor 4, which was selected to have a low impedance at the selected center frequency. Through the diode 3, however, current can flow in one direction, but not in the other. In the embodiment illustrated, current flows through diode 3 from left to right, but not in reverse. Since d.c. current cannot flow through capacitor 4, a charge will build up on the capacitor, the plus side being on the right, as shown.

The purpose of the antenna is to gather enough power to present a voltage of about 1.5 volts and a current of about 100 microamps at the output which appears at output terminals 5 across capacitor 4. This power is used to power the electronic identification circuit (not shown) which will be connected to terminals 5. The identification circuit, powered by the antenna of the invention, changes the load across capacitor 4 in a predetermined fashion, which results in changed r-f currents on elements 1 and 2 of the antenna. This causes the antenna to produce reflected fields, modulated by the identification code stored in the identification circuit. All of this is described in U.S. Patent No. 4,075,632 assigned to the same assignee as this invention.

Referring to FIGURE 2, another embodiment of the invention is shown. It operates exactly like the one in FIGURE 1, and all of the elements are numbered identically. The difference is the addition of a matching section comprised of a pair of conductive lines 6, one end of which is coupled respectively to each of the ends of U-shaped elements 1 and 2 which were connected to diode 3 in FIGURE 1. The diode 3 is series-coupled across the other ends of the matching section 6. The matching section 6 is used, if re-

quired, to obtain a better match of the impedance of the diode 3 to the impedance of the antenna.

The preferred embodiment of FIGURE 3 shows two dipole sections 10 and 11 coupled together in d.c. series. These two sections 10 and 11 are separated from each other by at least one-third of a wavelength of the transmitted signal, preferably by at least one-half wavelength. At 2450 MHz, this would amount to a distance greater than about 4 centimeters. The individual arrays may use dipole elements of the same geometry, and may use the same type of diode and capacitors for both capacitors 13 and 14, and for both diodes 15 and 16, or they may be different. The choice depends upon the precise power and frequency of the transmitted signal, as well as upon the availability of necessary components. The output signal from the antenna of FIGURE 3 appears at terminals 17. The dipoles 10 and 11 are connected by lines 18, 19 and 20.

FIGURE 4 shows the mounting of the dipole elements 1 and 2 on metallic backplane 30. Dipole elements 1 and 2 are mounted on a conventional printed circuit board substrate 31, usually made of fiberglass epoxy. The p.c. board substrate 31 is attached to and spaced from metallic backplane 30 by insulating two spacers 32 and 33, as shown. The distance between substrate 31 and backplane 30 is very important to the invention. It should be a distance equal to between about one-tenth and one-quarter wavelength of the transmitted signal. If that signal has a frequency of 2450 MHz, this distance should be between about 1 and 3 centimeters.

Although the invention has been described in terms of its preferred embodiments, it should be understood that many modifications may be made without departing from the spirit and scope of the invention, as is recited in the claims which follow.

Claims

1. An antenna for receiving and modulating transmitted signals having very low power density at the antenna on the order of below about 1 watt per meter squared, at a selected center frequency above 2000 MHz, comprising:

a folded planar dipole section having two separated oppositely disposed U-shaped elements (1,2), each of said elements having a pair of ends;

a capacitor (4) series coupled between two oppositely disposed ends of said two elements (1,2);

a diode (3) having a predetermined impedance at said selected center frequency, series coupled between the other two oppositely disposed ends of said two elements (1,2);

a metallic backplane mounted parallel to

said planar folded dipole section and spaced therefrom by a predetermined distance selected to reduce the antenna impedance, the impedance of said diode (3), the shape of said folded planar dipole section and the predetermined amount of spacing of said backplane from said planar folded dipole section all being selected to increase the d.c. power output of the antenna across the capacitor (4).

2. The antenna of claim 1 further characterized by the capacitor (4) being selected to have a low impedance at said selected center frequency.

3. The antenna of claim 2 further characterized by said diode (3) being selected to have an impedance above about 100 ohms at said selected center frequency.

4. The antenna of claim 3 further characterized by said diode (3) being a Schottky barrier diode.

5. The antenna of claim 1 further characterized by the predetermined spacing between said planar folded dipole section and said backplane being a distance equal to between one-tenth and one-quarter wavelength of the transmitted signal.

6. An antenna for receiving and modulating transmitted signals having very low power density at the antenna on the order of below about 1 watt per meter squared, at a selected center frequency above 2000 MHz, comprising:

a folded planar dipole section having two separated oppositely disposed U-shaped elements (1,2), each of said elements having a pair of ends;

a capacitor (4) series coupled between two oppositely disposed ends of said two elements (1,2);

a matching section consisting of two conductive lines (6), one end of each line coupled to each of the other two oppositely disposed ends of said two U-shaped elements (1,2);

a diode (3) having a predetermined impedance at said selected center frequency, series coupled between the other ends of said two conductive lines (6) of said matching section;

a metallic backplane mounted parallel to said planar folded dipole section and spaced therefrom by a predetermined distance selected to reduce the antenna impedance, the impedance of said diode (3), the shape of said folded planar dipole section and the predetermined amount of spacing of said backplane from said planar folded dipole section all being selected to increase the d.c. power output of the antenna across the capacitor (4).

quired, to obtain a better match of the impedance of the diode 3 to the impedance of the antenna.

The preferred embodiment of FIGURE 3 shows two dipole sections 10 and 11 coupled together in d.c. series. These two sections 10 and 11 are separated from each other by at least one-third of a wavelength of the transmitted signal, preferably by at least one-half wavelength. At 2450 MHz, this would amount to a distance greater than about 4 centimeters. The individual arrays may use dipole elements of the same geometry, and may use the same type of diode and capacitors for both capacitors 13 and 14, and for both diodes 15 and 16, or they may be different. The choice depends upon the precise power and frequency of the transmitted signal, as well as upon the availability of necessary components. The output signal from the antenna of FIGURE 3 appears at terminals 17. The dipoles 10 and 11 are connected by lines 18, 19 and 20.

FIGURE 4 shows the mounting of the dipole elements 1 and 2 on metallic backplane 30. Dipole elements 1 and 2 are mounted on a conventional printed circuit board substrate 31, usually made of fiberglass epoxy. The p.c. board substrate 31 is attached to and spaced from metallic backplane 30 by insulating two spacers 32 and 33, as shown. The distance between substrate 31 and backplane 30 is very important to the invention. It should be a distance equal to between about one-tenth and one-quarter wavelength of the transmitted signal. If that signal has a frequency of 2450 MHz, this distance should be between about 1 and 3 centimeters.

Although the invention has been described in terms of its preferred embodiments, it should be understood that many modifications may be made without departing from the spirit and scope of the invention, as is recited in the claims which follow.

Claims

1. An antenna for receiving and modulating transmitted signals having very low power density at the antenna on the order of below about 1 watt per meter squared, at a selected center frequency above 2000 MHz, comprising:
 - a folded planar dipole section having two separated oppositely disposed U-shaped elements (1,2), each of said elements having a pair of ends;
 - a capacitor (4) series coupled between two oppositely disposed ends of said two elements (1,2);
 - a diode (3) having a predetermined impedance at said selected center frequency, series coupled between the other two oppositely disposed ends of said two elements (1,2);
 - a metallic backplane mounted parallel to

said planar folded dipole section and spaced therefrom by a predetermined distance selected to reduce the antenna impedance, the impedance of said diode (3), the shape of said folded planar dipole section and the predetermined amount of spacing of said backplane from said planar folded dipole section all being selected to increase the d.c. power output of the antenna across the capacitor (4).

2. The antenna of claim 1 further characterized by the capacitor (4) being selected to have a low impedance at said selected center frequency.
3. The antenna of claim 2 further characterized by said diode (3) being selected to have an impedance above about 100 ohms at said selected center frequency.
4. The antenna of claim 3 further characterized by said diode (3) being a Schottky barrier diode.
5. The antenna of claim 1 further characterized by the predetermined spacing between said planar folded dipole section and said backplane being a distance equal to between one-tenth and one-quarter wavelength of the transmitted signal.
6. An antenna for receiving and modulating transmitted signals having very low power density at the antenna on the order of below about 1 watt per meter squared, at a selected center frequency above 2000 MHz, comprising:
 - a folded planar dipole section having two separated oppositely disposed U-shaped elements (1,2), each of said elements having a pair of ends;
 - a capacitor (4) series coupled between two oppositely disposed ends of said two elements (1,2);
 - a matching section consisting of two conductive lines (6), one end of each line coupled to each of the other two oppositely disposed ends of said two U-shaped elements (1,2);
 - a diode (3) having a predetermined impedance at said selected center frequency, series coupled between the other ends of said two conductive lines (6) of said matching section;
 - a metallic backplane mounted parallel to said planar folded dipole section and spaced therefrom by a predetermined distance selected to reduce the antenna impedance, the impedance of said diode (3), the shape of said folded planar dipole section and the predetermined amount of spacing of said backplane from said planar folded dipole section all being selected to increase the d.c. power output of the antenna across the capacitor (4).



7. The antenna of claim 6 further characterized by the capacitor (4) being selected to have a low impedance at said selected center frequency.
8. The antenna of claim 7 further characterized by said diode (3) being selected to have an impedance above about 100 ohms at said selected center frequency.
9. The antenna of claim 8 further characterized by said diode (3) being a Schottky barrier diode.
10. The antenna of claim 6 further characterized by the predetermined spacing between said planar folded dipole section and said backplane being a distance equal to between one-tenth and one-quarter wavelength of the transmitted signal.
11. The antenna of claim 1 or 6 further characterized in that said planar folded dipole section forms a first dipole section (10) and is connected in d.c. series with a second planar folded dipole section (11), said second dipole section (11) having a diode (15) and a capacitor (14) and being mounted with the same spacing on the same backplane mounting as said first dipole section (10).
12. The antenna of claim 11 further characterized by said second diode (15) and said second capacitor (14) being the same types as those (16,13) in said first folded dipole section (10).
13. The antenna of claim 11 further characterized by the spacing between the first and second dipole sections (10,11) being a distance of at least one-third wave length at said selected frequency.

Patentansprüche

1. Antenne zum Empfangen und Modulieren von gesendeten Signalen mit sehr niedriger antennen-seitiger Leistungsdichte in der Größenordnung von weniger als etwa 1 W/m^2 bei einer gewählten Mittenfrequenz oberhalb von 2000 MHz, aufweisend:
 - einen gefalteten planaren Dipolabschnitt mit zwei getrennten, gegenüberliegend angeordneten U-förmigen Elementen (1,2), die jeweils ein Endenpaar haben;
 - einen zwischen einander gegenüberliegenden Enden der beiden Elemente (1,2) in Serie geschalteten Kondensator (4);
 - eine vorgegebene Impedanz bei der ausgewählten Mittenfrequenz habende Diode, die zwischen den anderen beiden einander gegenüberliegenden Enden der beiden Elemente (1, 2) in Serie geschaltet ist;

eine zum planaren, gefalteten Dipolabschnitt parallel angeordnete und von diesem um eine vorgegebene Distanz beabstandete metallische Rückplatte zur Verringerung der Antennenimpedanz, wobei die Impedanz der Diode (3), die Form des gefalteten, planaren Dipolabschnitts und der vorgegebene Abstand der Rückplatte von dem planaren, gefalteten Dipolabschnitt insgesamt so gewählt sind, daß die Gleichstrom-Ausgangsleistung der Antenne am Kondensator (4) erhöht wird.

2. Antenne nach Anspruch 1, dadurch gekennzeichnet, daß der Kondensator (4) so gewählt ist, daß er eine niedrige Impedanz bei der gewählten Mittenfrequenz hat.
3. Antenne nach Anspruch 2, dadurch gekennzeichnet, daß die Diode (3) so gewählt ist, daß sie eine Impedanz oberhalb von etwa 100 Ohm bei der gewählten Mittenfrequenz hat.
4. Antenne nach Anspruch 3, dadurch gekennzeichnet, daß die Diode (3) eine Schottky-Sperrschichtdiode ist.
5. Antenne nach Anspruch 1, dadurch gekennzeichnet, daß der vorgegebene Abstand zwischen dem planaren, gefalteten Dipolabschnitt und der Rückplatte in einem Bereich zwischen $1/10$ und $1/4$ der Wellenlänge des Sendesignals liegt.
6. Antenne zum Empfangen und Modulieren von gesendeten Signalen, die an der Antenne eine sehr niedrige Leistungsdichte in der Größenordnung von unter etwa 1 W/m^2 bei einer gewählten Mittenfrequenz von mehr als 2000 MHz haben, aufweisend:

einen gefalteten planaren Dipolabschnitt mit zwei getrennten, gegenüberliegend angeordneten U-förmigen Elementen (1,2), die jeweils ein Endenpaar haben;

einen zwischen einander gegenüberliegenden Enden der beiden Elemente (1,2) in Serie geschalteten Kondensator (4);

einen Anpaßabschnitt, bestehend aus zwei leitenden Leitungen (6), deren eines Ende jeweils mit einem der beiden anderen einander gegenüberliegenden Enden der beiden U-förmigen Elemente (1, 2) gekoppelt ist;

eine vorgegebene Impedanz bei der ausgewählten Mittenfrequenz aufweisende Diode (3), die zwischen den anderen Enden der beiden leitenden Leitungen (6) des Anpaßabschnitts in Serie geschaltet ist;

eine zum planaren, gefalteten Dipolabschnitt parallel angeordnete und von diesem um eine vorgegebene Distanz beabstandete metalli-



sche Rückplatte zur Verringerung der Antennenimpedanz, wobei die Impedanz der Diode (3), die Form des gefalteten, planaren Dipolabschnitts und der vorgegebene Abstand der Rückplatte von dem planaren, gefalteten Dipolabschnitt insgesamt so gewählt sind, daß die Gleichstrom-Ausgangsleistung der Antenne am Kondensator (4) erhöht wird.

7. Antenne nach Anspruch 6, dadurch gekennzeichnet, daß der Kondensator (4) so gewählt ist, daß er eine niedrige Impedanz bei der gewählten Mittenfrequenz hat. 10
8. Antenne nach Anspruch 7, dadurch gekennzeichnet, daß die Diode (3) so gewählt ist, daß sie eine Impedanz oberhalb von etwa 100 Ohm bei der gewählten Mittenfrequenz hat. 15
9. Antenne nach Anspruch 8, dadurch gekennzeichnet, daß die Diode (3) eine Schottky-Sperrschichtdiode ist. 20
10. Antenne nach Anspruch 6, dadurch gekennzeichnet, daß der vorgegebene Abstand zwischen dem planaren, gefalteten Dipolabschnitt und der Rückplatte in einem Bereich zwischen 1/10 und 1/4 der Wellenlänge des Sendesignals liegt. 25
11. Antenne nach Anspruch 1 oder 6, dadurch gekennzeichnet, daß der planare, gefaltete Dipolabschnitt einen ersten Dipolabschnitt (10) bildet und mit einem zweiten planaren, gefalteten Dipolabschnitt gleichstrommäßig in Serie geschaltet ist, wobei der zweite Dipolabschnitt (11) eine Diode (15) und ein Kondensator (14) aufweist und mit dem gleichen Abstand wie der erste Dipolabschnitt (10) von derselben Rückplatte entfernt angeordnet ist. 30
12. Antenne nach Anspruch 11, dadurch gekennzeichnet, daß die zweite Diode (15) und der zweite Kondensator (14) vom gleichen Typ sind, wie diejenigen (16, 13) in dem ersten gefalteten Dipolabschnitt (10). 35
13. Antenne nach Anspruch 11, dadurch gekennzeichnet, daß der Abstand zwischen dem ersten und zweiten Dipolabschnitt (120, 11) gleich wenigstens einem Drittel der Wellenlänge bei der gewählten Mittenfrequenz ist. 40

Revendications

1. Antenne de réception et de modulation de signaux transmis ayant une très faible densité de puissance à l'antenne, de l'ordre de moins d'en-

viron 1 watt par mètre carré à une fréquence centrale choisie qui est supérieure à 2000 MHz, comprenant :

une section de dipôle plan replié ayant deux éléments séparés en U (1, 2) disposés en face l'un de l'autre, chacun desdits éléments ayant deux extrémités ;

un condensateur (4) monté en série entre deux extrémités disposées face à face desdits deux éléments (1,2) ;

une diode (3) ayant une impédance prédéterminée à ladite fréquence centrale choisie, montée en série entre les deux autres extrémités placées face à face desdits deux éléments (1, 2) ;

un plan métallique de fond monté en parallèle avec ladite section de dipôle plan replié et placé par rapport à celle-ci à une distance prédéterminée qui est choisie de manière à réduire l'impédance de l'antenne, l'impédance de ladite diode (3), la forme de ladite section de dipôle plan replié et la longueur prédéterminée de la distance séparant ledit plan de fond de ladite section de dipôle plan replié étant toutes choisies de manière à augmenter la puissance de sortie en courant continu de l'antenne aux bornes du condensateur (4).

2. Antenne selon la revendication 1, caractérisée par ailleurs en ce que le condensateur (4) est choisi de manière à avoir une faible impédance à ladite fréquence centrale choisie.
3. Antenne selon la revendication 2, caractérisée par ailleurs en ce que ladite diode (3) est choisie de manière qu'elle aie une impédance supérieure à environ 100 ohms à ladite fréquence centrale choisie.
4. Antenne selon la revendication 3, caractérisée par ailleurs en ce que ladite diode (3) est une diode à barrière de Schottky.
5. Antenne selon la revendication 1, caractérisée par ailleurs en ce que la distance prédéterminée séparant ladite section de dipôle replié plan et ledit plan de fond est une distance comprise entre un dixième et un quart de la longueur d'onde du signal transmis.
6. Antenne de réception et de modulation de signaux transmis ayant une très faible densité de puissance à l'antenne, qui est de l'ordre de moins d'environ 1 watt par mètre carré à une fréquence centrale sélectionnée qui est supérieure à 2000 MHz, comprenant :

une section de dipôle plan replié ayant deux éléments séparés en U (1, 2) disposés face à face, chacun desdits éléments ayant deux ex-



trémities ;

un condensateur (4) monté en série entre deux extrémités placées face à face desdits deux éléments (1, 2) ;

une section compatible consistant en deux lignes conductrices (6), une extrémité de chaque ligne étant connectée à chacune des deux autres extrémités disposées face à face desdits deux éléments en U (1, 2) ;

une diode (3) ayant une impédance prédéterminée à ladite fréquence centrale choisie, montée en série entre les autres extrémités desdites deux lignes conductrices (6) de ladite section compatible ;

un plan métallique de fond monté en parallèle avec ladite section de dipôle replié plan et placé par rapport à celle-ci à une distance prédéterminée qui est choisie de manière à réduire l'impédance de l'antenne, l'impédance de ladite diode (3), la forme de ladite section de dipôle plan replié et la longueur prédéterminée de l'espace séparant ledit plan de fond et ladite section de dipôle replié plan étant toutes choisies de manière à augmenter la puissance de sortie en courant continu de l'antenne aux bornes du condensateur (4).

7. Antenne selon la revendication 6, caractérisée par ailleurs en ce que le condensateur (4) est choisi de manière qu'il aie une faible impédance à ladite fréquence centrale choisie.
8. Antenne selon la revendication 7, caractérisée par ailleurs en ce que ladite diode (3) est choisie de manière qu'elle aie une impédance supérieure à environ 100 ohms à ladite fréquence centrale choisie.
9. Antenne selon la revendication 8, caractérisée par ailleurs en ce que ladite diode (3) est une diode à barrière de Schottky.
10. Antenne selon la revendication 6, caractérisée par ailleurs en ce que la distance prédéterminée séparant ladite section de dipôle plan replié et ledit plan de fond est une distance comprise entre un dixième et un quart de la longueur d'onde du signal transmis.
11. Antenne selon la revendication 1 ou 6, caractérisée par ailleurs en ce que ladite section de dipôle replié plan forme une première section de dipôle (10) et elle est connectée en série en courant continu avec une seconde section de dipôle replié plan (11), ladite seconde section de dipôle replié plan (11) comprenant une diode (15) et un condensateur (14) et étant montée à la même distance sur le même montage de plan de fond que

ladite première section de dipôle (10).

12. Antenne selon la revendication 11, caractérisée par ailleurs en ce que ladite seconde diode (15) et ledit second condensateur (14) sont du même type que ceux (16, 13) qui sont situés dans ladite première section de dipôle replié (10).
13. Antenne selon la revendication 11, caractérisée par ailleurs en ce que la distance séparant les première et seconde sections de dipôle (10, 11) est une distance correspondant à au moins un tiers de la longueur d'onde de ladite fréquence choisie.

