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McCown

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(54) **PASSIVE PARABOLIC ANTENNA, WIRELESS COMMUNICATION SYSTEM AND METHOD OF BOOSTING SIGNAL STRENGTH OF A SUBSCRIBER MODULE ANTENNA**

(76) Inventor: **James Charles McCown**, Lake Point, UT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 148 days.

This patent is subject to a terminal disclaimer.

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(22) Filed: **Sep. 21, 2010**

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Related U.S. Application Data

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(60) Provisional application No. 60/816,700, filed on Jun. 27, 2006.

(51) **Int. Cl.**
H01Q 19/18 (2006.01)

(52) **U.S. Cl.** **343/840**

(58) **Field of Classification Search** .... 343/700 MS, 343/702, 818, 834–837, 840, 872
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,859,657 A 1/1975 Sterner
D327,690 S 7/1992 Ogawa et al.
D363,935 S 11/1995 McGreevy
D379,818 S 6/1997 Aldama et al.
D401,594 S 11/1998 Nishimura et al.
D418,142 S 12/1999 Liimatainen et al.
D421,439 S 3/2000 Giuntoli
D427,996 S 7/2000 Heiligenstein et al.
6,133,882 A 10/2000 LaFleur et al.
6,445,360 B2 9/2002 Al-Rawi et al.
6,876,337 B2 4/2005 Larry
6,891,506 B2 5/2005 Jarmuszewski et al.
6,977,624 B1 12/2005 Szente et al.
7,800,551 B2 * 9/2010 McCown 343/837
2002/0097185 A1 7/2002 Hershey et al.
2004/0201534 A1 10/2004 Hagiwara
2005/0017906 A1 1/2005 Man et al.

FOREIGN PATENT DOCUMENTS

EP 1 033 779 A2 9/2000
WO WO 00/74254 A1 12/2000

OTHER PUBLICATIONS

Stinger Passive Gain Antenna for 5.7 Ghz SMS http://wirelessbeehive.com/motorola/stinger.php , Dec. 2010.
Motorola CANOPY™ AP , Dec. 2010.

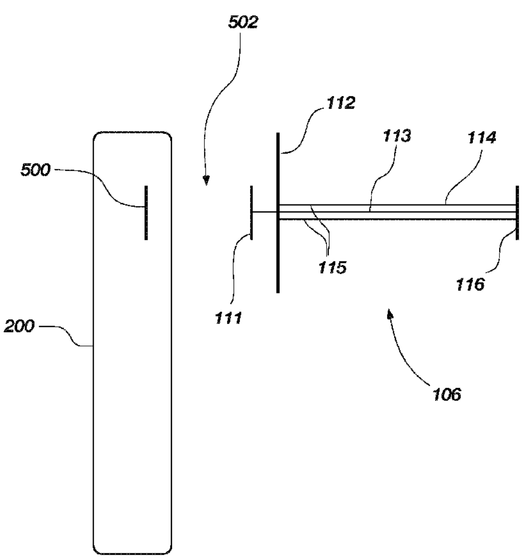
* cited by examiner

Primary Examiner — Michael C Wimer
(74) *Attorney, Agent, or Firm* — Paul C. Oestreich; Eminent IP, P.C.

(57) **ABSTRACT**

The invention is a passive parabolic antenna system for use with conventional subscriber module radio antennas. The passive parabolic antenna system includes a microwave feed assembly that forms a resonant cavity coupling device for coupling to an internal patch antenna of a conventional subscriber module radio antenna. A method of boosting signal strength of a conventional subscriber module radio antenna and a wireless communication system are also disclosed.

26 Claims, 9 Drawing Sheets



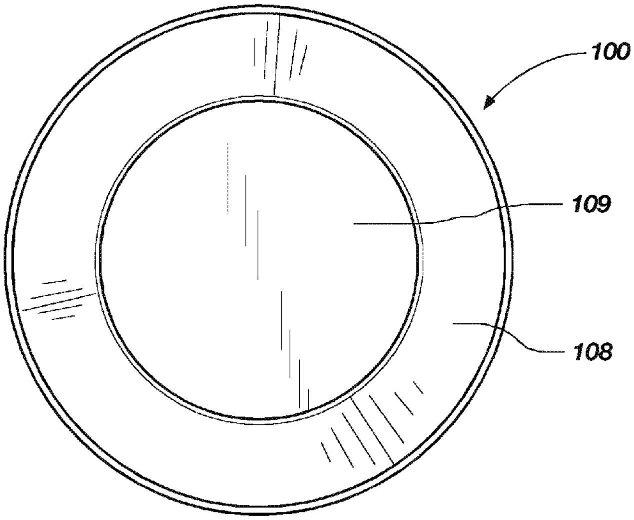


FIG. 1

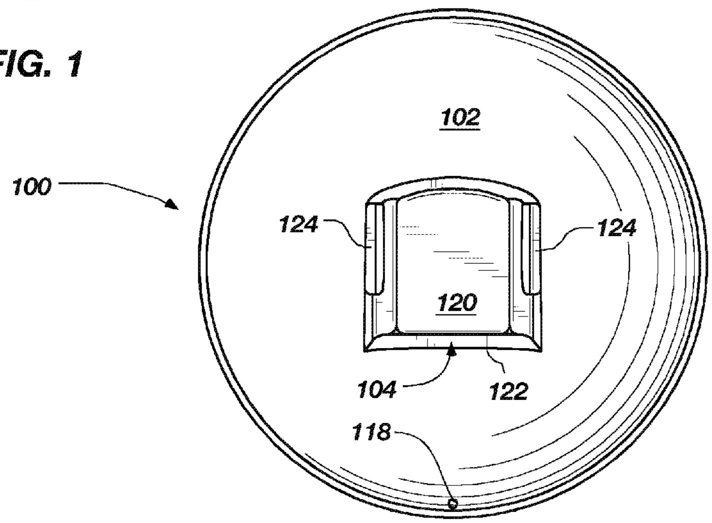


FIG. 2

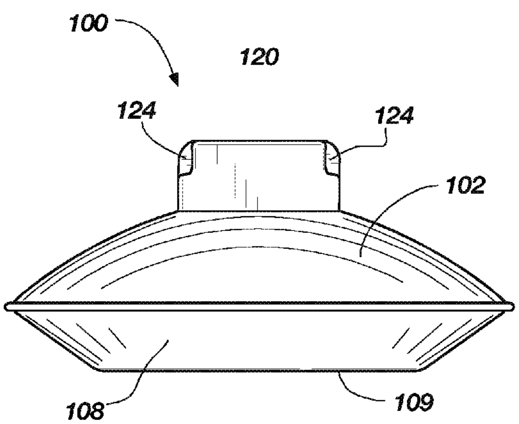


FIG. 3

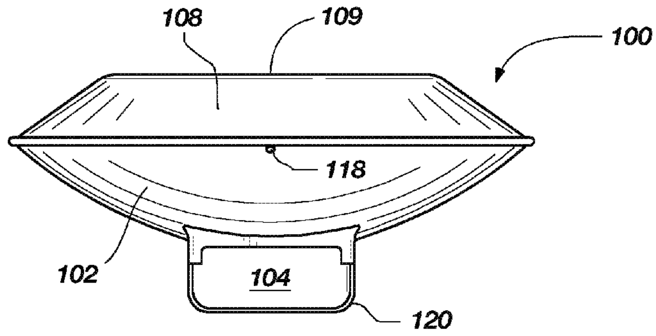


FIG. 4

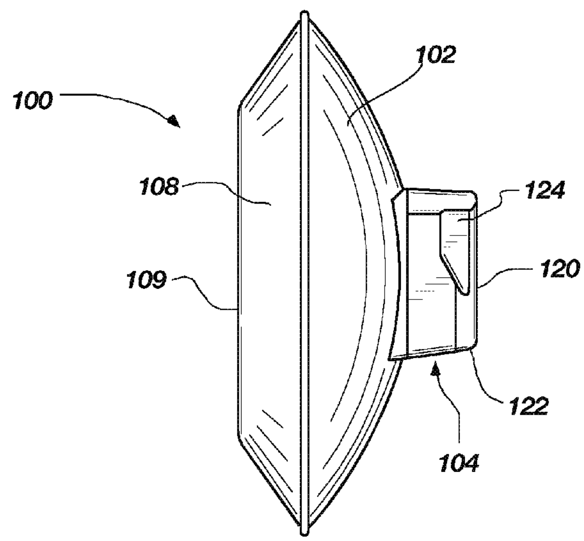


FIG. 5

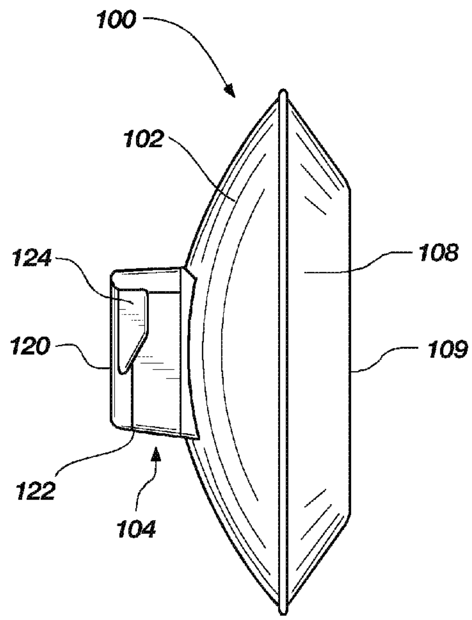


FIG. 6

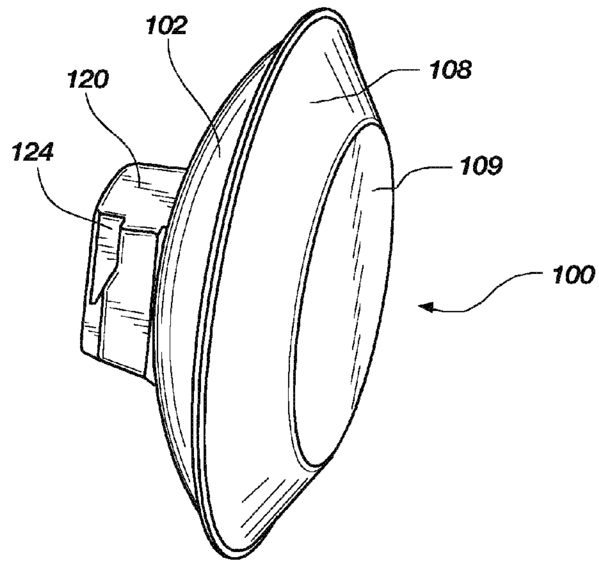


FIG. 7

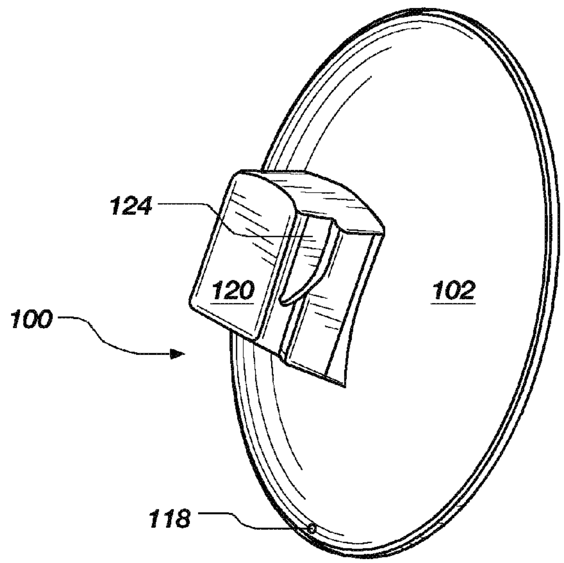


FIG. 8

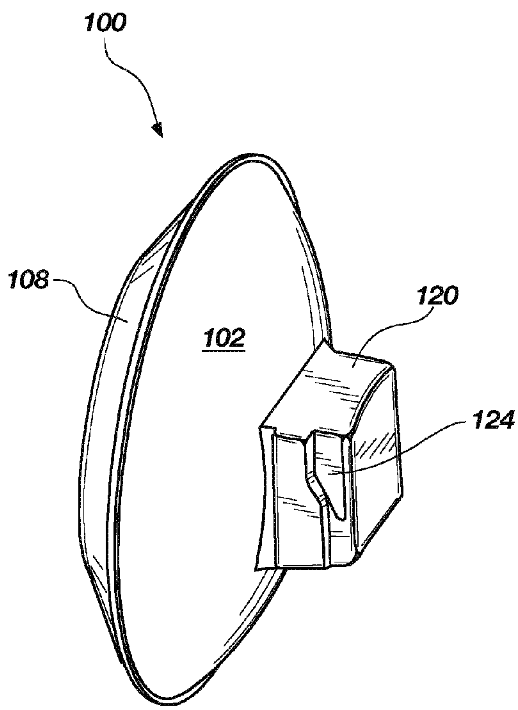


FIG. 9

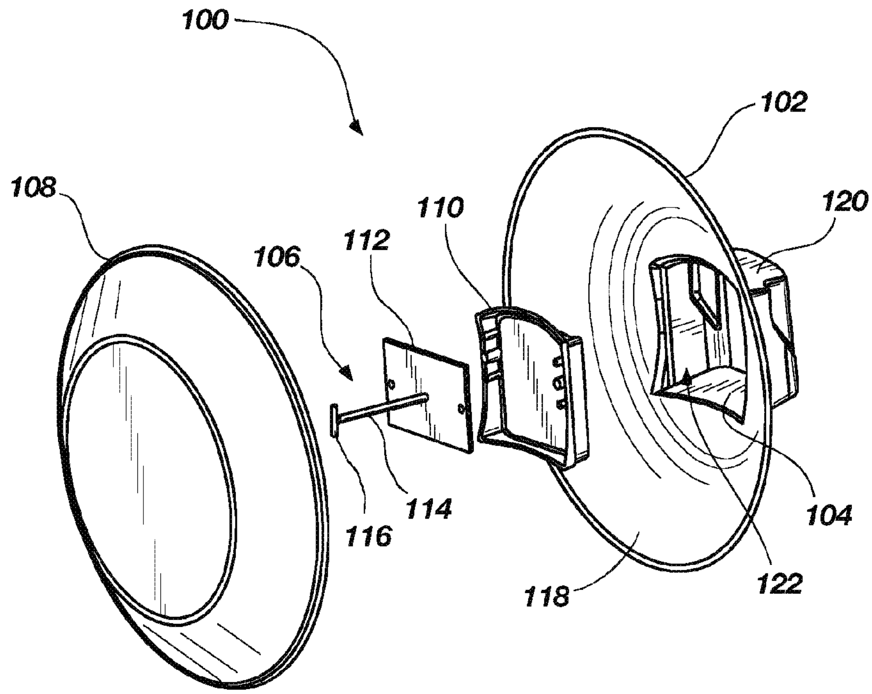


FIG. 10A

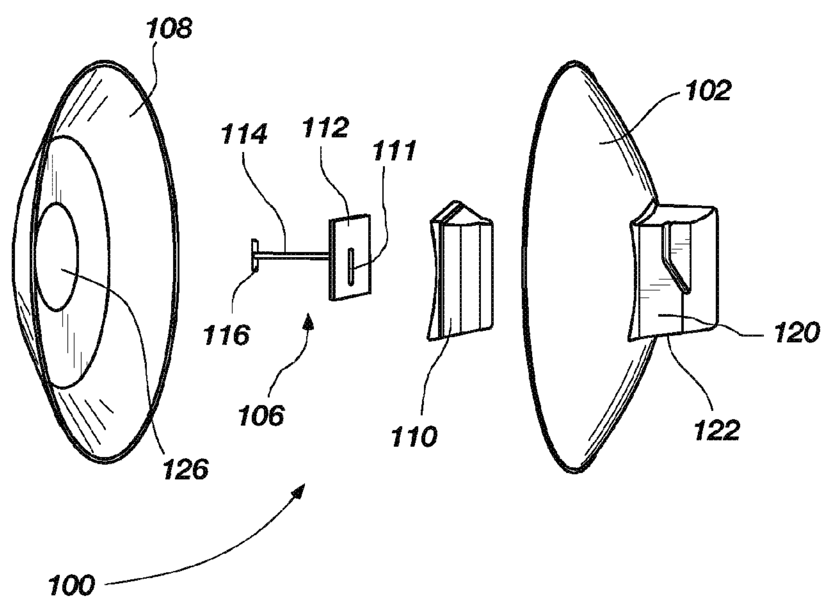


FIG. 10B

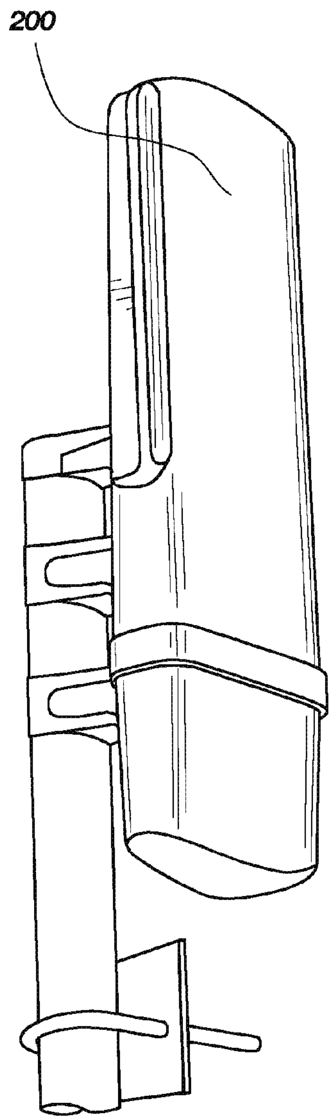


FIG. 11A
(PRIOR ART)

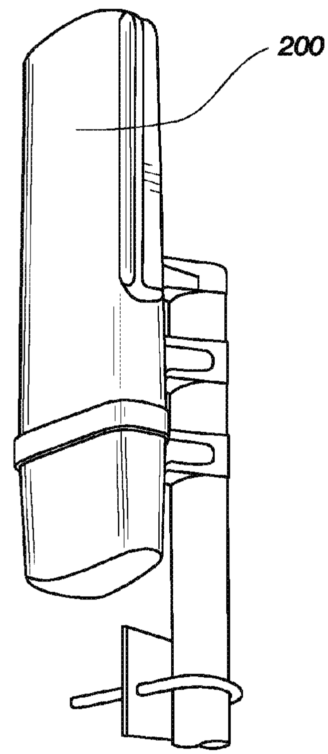


FIG. 11B
(PRIOR ART)

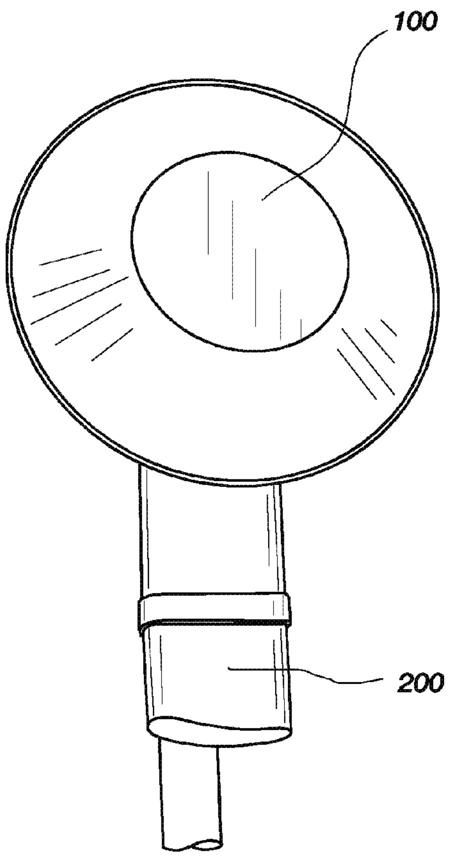


FIG. 12A

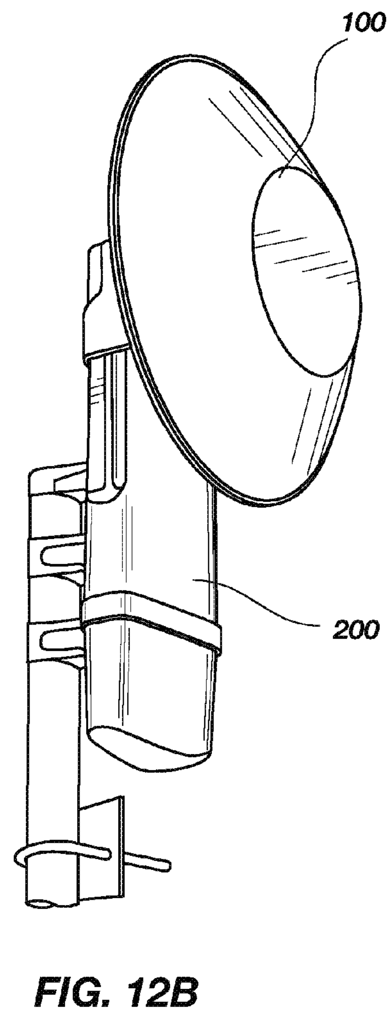


FIG. 12B

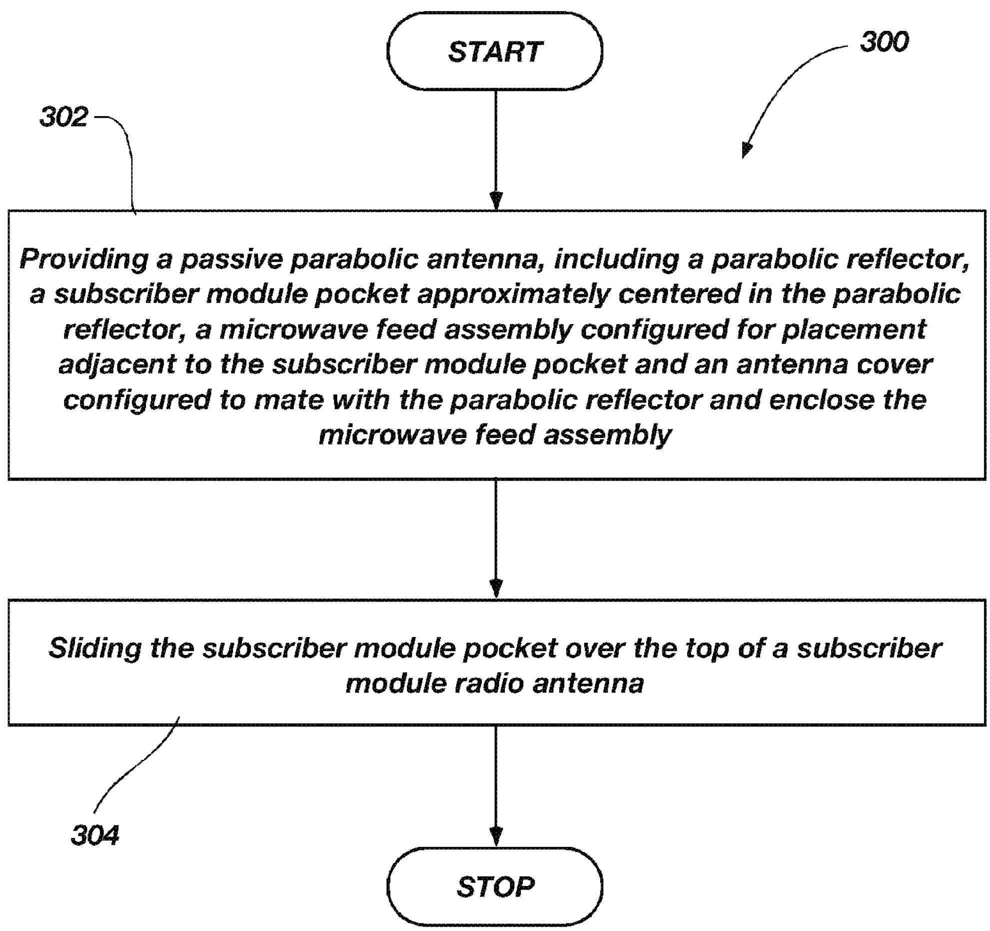

START
300
302
Providing a passive parabolic antenna, including a parabolic reflector, a subscriber module pocket approximately centered in the parabolic reflector, a microwave feed assembly configured for placement adjacent to the subscriber module pocket and an antenna cover configured to mate with the parabolic reflector and enclose the microwave feed assembly
Sliding the subscriber module pocket over the top of a subscriber module radio antenna
304
STOP

FIG. 13

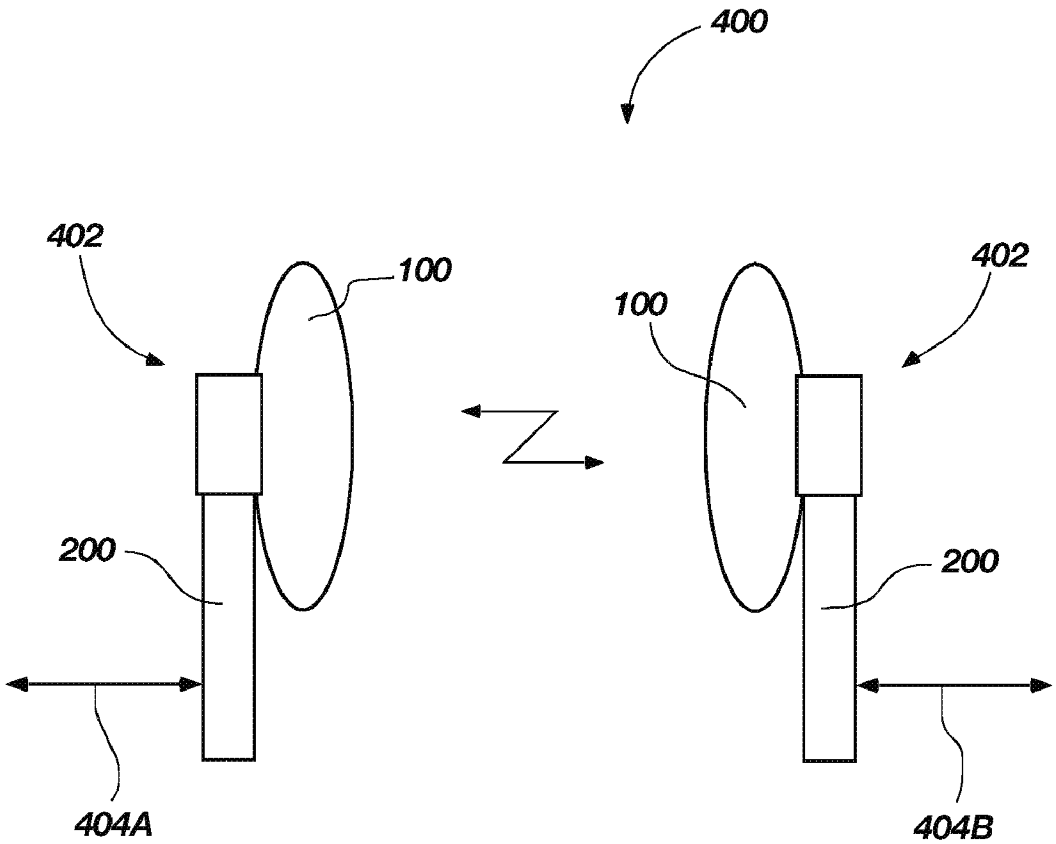


FIG. 14

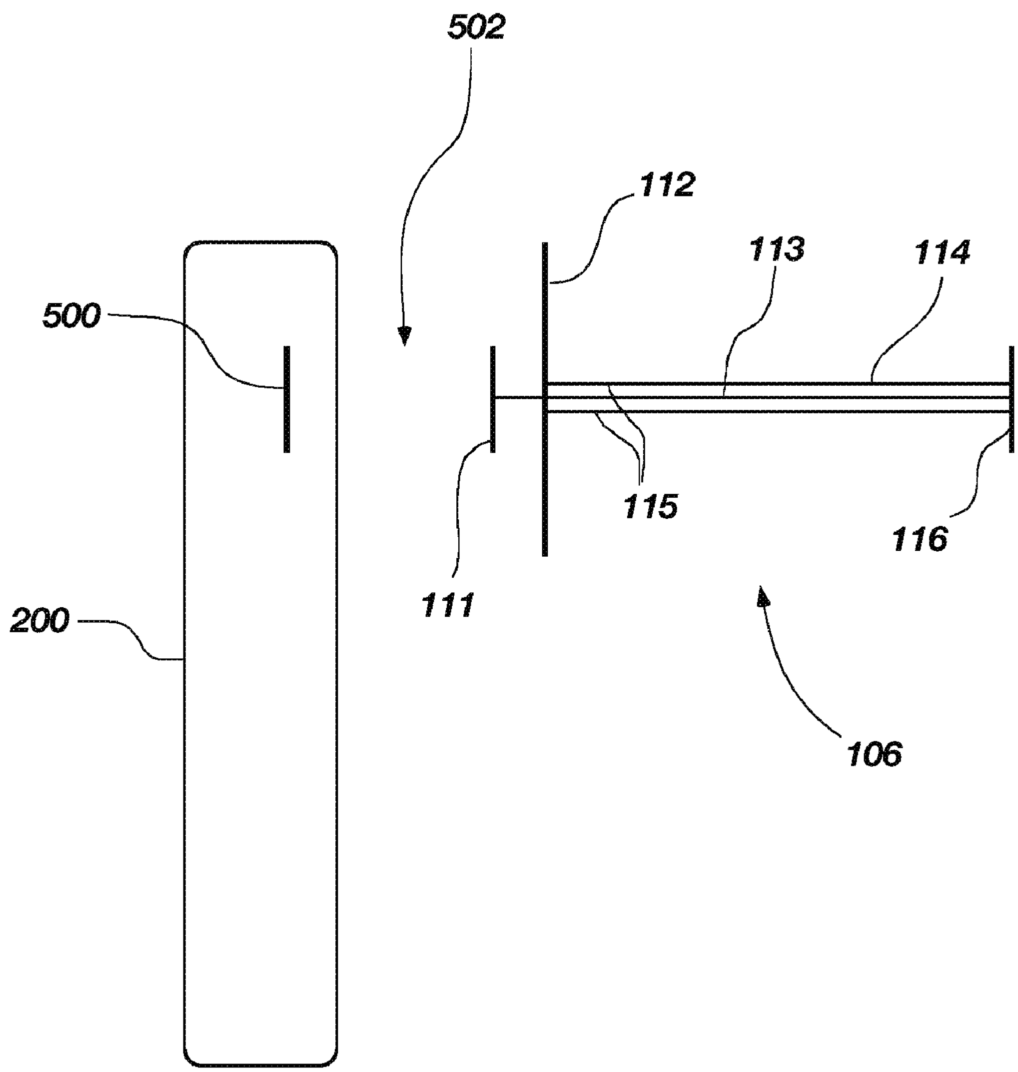


FIG. 15

PASSIVE PARABOLIC ANTENNA, WIRELESS COMMUNICATION SYSTEM AND METHOD OF BOOSTING SIGNAL STRENGTH OF A SUBSCRIBER MODULE ANTENNA

CROSS-REFERENCE TO RELATED APPLICATIONS

This continuation application claims priority to nonprovisional patent application Ser. No. 11/656,687 issued as U.S. Pat. No. 7,800,551 on Sep. 21, 2010, which in turn claims benefit of U.S. Provisional patent application Ser. No. 60/816,700 filed on Jun. 27, 2006, titled "PASSIVE PARABOLIC ANTENNA SYSTEM AND METHOD FOR BOOSTING SIGNAL STRENGTH OF A SUBSCRIBER MODULE ANTENNA", now expired, the contents of both of which are incorporated herein by reference for all purposes. This continuation patent application is also related to U.S. Design patent application Ser. No. 29/264,719 filed on Aug. 16, 2006, titled: "PARABOLIC ANTENNA", issued Jun. 5, 2007 as U.S. Design Pat. No. D543,975, the contents of which are also incorporated herein by reference for all purposes.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to antennas for wireless communication systems. More particularly, this invention relates to a passive parabolic antenna system and method for boosting signal strength of subscriber module radio antennas.

2. Description of Related Art

Conventional wireless broadband radio systems are becoming increasingly popular for providing data and voice communications that are free from electrical connections. Popular home and office based wireless systems may be based on various wireless network communication standards. Examples of such wireless standards may include those promulgated by the Institute for Electrical and Electronics Engineers (IEEE), particularly IEEE 802.11 based standards.

More sophisticated business-based wireless communications systems suitable for building to building transmissions may operate at various frequency bands including 2.4 GHz, 900 MHz, 5.2 GHz and 5.7 GHz with various transmission protocols. For example, the Unlicensed National Information Infrastructure radio band (UNII) is part of the radio frequency spectrum used by IEEE-802.11a wireless devices. UNII operates over various frequency ranges from about 5.2 GHz to about 5.8 GHz. Some of these more sophisticated wireless communications systems achieve greater operational distances by utilizing higher broadcasting power. However, increasing power may cause interference to other communications systems and increases cost.

One particular wireless transmission system is the Motorola™ Canopy® subscriber module, available from Motorola Canopy, 1299 East Algonquin Rd., Schaumburg, Ill. 60196. The Motorola™ Canopy® subscriber module radio antenna **200** (see FIGS. **11**A-B) is used to transmit from building to building or over distances of 1-2 miles at frequencies ranging from 5.745 to 5.805 GHz. However, there is always a need for improved signal strength and greater distances between antennas.

Accordingly, there exists a need in the art for a passive parabolic antenna system and method capable of passively coupling to conventional subscriber module radio antennas operating at any suitable frequency and power to improve signal strength and thereby increasing the operational distance between antennas without resorting to increasing power to generate transmission signals.

BRIEF SUMMARY OF THE INVENTION

The invention is a passive parabolic antenna that incorporates a parabolic reflector with a passive coupling and feed mechanism for use with conventional subscriber module radio antennas. The passive parabolic antenna forms a resonant cavity coupling device that couples to the existing internal patch antenna of a conventional subscriber module radio antenna. A method of boosting signal strength of a conventional subscriber module radio antenna and a wireless communication system are also disclosed.

Additional features and advantages of the invention will be apparent from the detailed description which follows, taken in conjunction with the accompanying drawings, which together illustrate, by way of example, features of embodiments of the present invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The following drawings illustrate exemplary embodiments for carrying out the invention. Like reference numerals refer to like parts in different views or embodiments of the present invention in the drawings.

FIG. **1** is a front view of a parabolic antenna according to the present invention.

FIG. **2** is a back view of a parabolic antenna according to the present invention.

FIG. **3** is a top view of a parabolic antenna according to the present invention.

FIG. **4** is a bottom view of a parabolic antenna according to the present invention.

FIG. **5** is a right side view of a parabolic antenna according to the present invention.

FIG. **6** is a left side view of a parabolic antenna according to the present invention.

FIG. **7** is a left-front perspective view of a parabolic antenna according to the present invention.

FIG. **8** is a left-rear perspective view of a parabolic antenna according to the present invention.

FIG. **9** is a right-rear perspective view of a parabolic antenna according to the present invention.

FIGS. **10**A-B are exploded perspective views of components of a passive parabolic antenna according to an embodiment of the present invention.

FIGS. **11**A-B are perspective images of a conventional subscriber module radio antenna.

FIGS. **12**A-B are perspective images of the embodiment of a passive parabolic antenna shown in FIGS. **10**A-B as mounted on a conventional subscriber module radio antenna, such as those shown in FIGS. **11**A-B.

FIG. **13** is a flowchart of an embodiment of a method of boosting signal strength of a conventional subscriber module radio antenna, according to the present invention.

FIG. **14** is a block diagram of an embodiment of a wireless communications system, according to the present invention.

FIG. **15** is a diagram of resonant cavity coupling, according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The invention is a passive parabolic antenna for use with conventional subscriber module radio antennas. The passive parabolic antenna forms a resonant cavity coupling device that couples to the existing internal patch antenna of a conventional subscriber module radio antenna. A method of boosting signal strength of a conventional subscriber module radio antenna using the passive parabolic antenna and a wireless communication system including same is also disclosed.

FIGS. **1-3** illustrate front, back and top views, respectively of an embodiment of an assembled passive parabolic antenna **100** according to the present invention. The passive parabolic antenna **100** may include a parabolic reflector **102** mated with an antenna cover **108**. The antenna cover may include a covering **120** for a subscriber module pocket **104** at the bottom end **122** of the covering **120**. Antenna cover **108** may be generally dish-shaped with a flat portion **109**. According to another embodiment, the passive parabolic antenna **100** may include a metallic subreflector **126** on an inside surface (see FIG. **10**B) of the flat portion **109** of the antenna cover **108**. The purpose and further description of the metallic subreflector **126** is further elaborated below.

As shown particularly in FIG. **2**, the passive parabolic antenna **100** may have small drain holes **118** (one illustrated) for draining water that may collect within the passive parabolic antenna **100** during inclement weather, according to one embodiment. FIGS. **2-3** also illustrate indentations **124** in covering **120** that may be ramped within the subscriber module pocket **104** to effect an interference or friction fit with a given subscriber module radio antenna (not shown but see **200** in FIGS. **11**A-B).

Referring now to FIGS. **4-6**, bottom, right side and left side views, respectively, of the embodiment of a passive parabolic antenna **100** are shown. In particular, FIG. **4** illustrates the subscriber module pocket **104** and an exemplary small drain hole **118**. The subscriber module pocket **104** may be configured to receive any suitable subscriber module radio antenna consistent with the teachings of the present invention. For example and not by way of limitation, the subscriber module pocket **104** may be configured to receive a conventional Motorola™ Canopy® subscriber module radio antenna (see **200** as illustrated in FIGS. **11**A-B and as further discussed herein). FIGS. **5** and **6** also illustrate indentations **124** in covering **120** that may be ramped within the subscriber module pocket **104** to effect an interference or friction fit with a given subscriber module radio antenna, e.g., the Motorola™ Canopy® subscriber module radio antenna (see **200** as illustrated in FIGS. **11**A-B).

FIGS. **7-9** are additional left-front, left-rear and right-rear perspective views, respectively, of the embodiment of a passive parabolic antenna **100** shown in FIGS. **1-6**. In particular, FIGS. **7-9** further illustrate indentations **124** in covering **120** that may be configured to effect an interference or friction fit with a given subscriber module radio antenna, e.g., the Motorola™ Canopy® subscriber module radio antenna (see **200** as illustrated in FIGS. **11**A-B). It will be noted that other means of securing the passive parabolic antenna **100** to a given subscriber module radio antenna may also be used consistent with the present invention. Such other means may include, for example and not by way of limitation, adhesives, fasteners, screws, mechanical detents, locking mechanisms and any other suitable securing means known to those of ordinary skill in the art consistent with the teachings of the present invention.

FIGS. **10**A-B are exploded perspective views of components within an embodiment of a passive parabolic antenna **100** according to the present invention. Referring to FIGS. **10**A and **10**B, the passive parabolic antenna **100** may include a parabolic reflector **102** and a subscriber module pocket **104** approximately centered in the parabolic reflector **102**. The subscriber module pocket **104** may include a covering **120** for surrounding the top of a conventional subscriber module antenna (see **200** in FIGS. **11**A-B and related discussion below). The bottom end **122** of subscriber module pocket **104** is open to receive the top of a conventional subscriber module antenna, e.g., see **200** in FIGS. **11**A-B and related discussion herein.

The passive parabolic antenna **100** may further include a microwave feed assembly **106** configured for placement adjacent the subscriber module pocket **104**. The structure of the subscriber module pocket **104** and/or the parabolic reflector **102** may be configured to receive microwave feed assembly **106** directly. The microwave feed assembly **106** may be configured to mount to the subscriber module pocket **104** and/or the parabolic reflector **102** via screws, snaps, adhesive or any other suitable means for securing the microwave feed assembly **106** adjacent to the subscriber module pocket **104**.

The passive parabolic antenna **100** may further include an antenna cover **108** configured to mate with the parabolic reflector **102** and enclose the microwave feed assembly **106**. The antenna cover **108** may be configured to hold a small foil patch subreflector (not shown in FIGS. **10**A-B). The antenna cover **108** may further be configured to provide shelter for the microwave feed assembly **106**. The subreflector (not shown in FIGS. **10**A-B) provides additional signal coupling to the dipole **116**, see further discussion below. According to another embodiment, the passive parabolic antenna **100** may further include an insert panel **110** for receiving the microwave feed assembly **106** and interfacing with the subscriber module pocket **104**. The insert panel may be secured to the parabolic reflector **102** by any suitable means, for example and not by way of limitation, adhesives, snaps, screws, detents or any other suitable securing means known to those skilled in the art.

The antenna cover **108** may be formed of any suitable dielectric materials, for example and not by way of limitation, acrylonitrile-butadiene-styrene (ABS) plastic, or any other plastic-like material, according to embodiments of the present invention. The antenna cover **108** is configured to be generally transparent to electromagnetic radiation.

The parabolic reflector **102** may also be formed of a plastic or plastic-like material according to embodiments of the passive parabolic antenna **100**. According to a particular embodiment, the parabolic reflector **102** may further include a metallic (conductive) covering or lining on a surface, e.g., the inside surface, of the parabolic reflector **102**. The metallic covering or lining is reflective of electromagnetic radiation. The metallic covering or lining may be formed by plasma arc coating of zinc or any other suitable means of providing a metallic coating on a surface of a parabolic reflector **102** comprising plastic structural material. According to another embodiment, the metallic lining may be formed of plasma arc coated metal, e.g., zinc. According to another embodiment, the metallic lining may be adhesively secured metal foil, e.g., aluminum foil. Alternatively, the parabolic reflector **102** may be formed of a metal or metal-like (conductive) material according to yet another embodiment of the present invention. It will be noted that any suitable metal may be used for the metallic lining or for the parabolic reflector **102** according to the teachings of the present invention.

According to certain embodiments, the passive parabolic antenna **100** may not be completely sealed or waterproof. Thus, water may collect inside the passive parabolic antenna **100** during wet environmental conditions. One embodiment of the passive parabolic antenna **100** may include one or more small drain holes **118** (see one small drain hole located at arrow **118** in FIGS. **2**, **4**, **8** and **10**A). The drain holes **118** may be formed in the parabolic reflector **102** and/or the antenna cover **108** according to embodiments of the present invention. Small drain holes **118** formed in a lower region of the parabolic reflector **102** and/or the antenna cover **108** allow water to escape under the force of gravity, and/or water vapor to escape into the atmosphere.

According to one embodiment of the present invention, the microwave feed assembly **106** may include a small rectangular patch antenna **111** (see FIG. **10**B) adjacent to a planar sheet of conductive material **112**. The planar sheet of conductive material **112** may serve as a ground plane for the patch antenna **111**. The generally planar sheet of conductive material **112** may be connected to a generally linear conductive rod **114**, which is in turn connected to a dipole **116**. The linear conductive rod **114** may be formed of a piece of semi-rigid coaxial cable according to one embodiment of microwave feed assembly **106**. According to another embodiment, dipole **116** may be adjacent to or connected to a small foil patch subreflector **126** (FIG. **10**B) on the inside surface of antenna cover **108**. The foil patch subreflector **126** may serve as a ground plane for the microwave feed assembly **106** when fully assembled. The subreflector may be formed of plasma arc coated metal, e.g., zinc, or an adhesive foil patch, e.g., an aluminum foil patch glued to the inner surface of the flat portion **109** of the antenna cover **108**.

The microwave feed assembly **106** forms a dipole antenna. The parabolic reflector **102** concentrates the field strength at the dipole **116**. The passive parabolic antenna **100** gathers, concentrates and couples communication signals into the microwave feed assembly **106** in a passive manner that does not require any direct electrical connection with an external subscriber module antenna (see, e.g., **200** in FIGS. **11**A-B and **12**).

The passive parabolic antenna **100** of the present invention may be configured for use with any conventional subscriber module antenna. FIGS. **11**A-B are perspective images of a conventional subscriber module radio antenna **200**, specifically a Motorola™ Canopy® subscriber module, available from Motorola Canopy, 1299 East Algonquin Rd., Schaumburg, Ill. 60196. However, the passive parabolic antenna **100** of the present invention is not limited to Motorola™ Canopy® subscriber modules and may be configured for use with any other suitable subscriber module antenna. For example and not by way of limitation, an embodiment of the passive parabolic antenna **100** of the present invention may be configured to work with a subscriber module antenna in an Access583™, 5.8/5.3 GHz Dual-Band Wireless Broadband System available from Trango Broadband Wireless, a division of Trango Systems, Inc., 15070 Avenue of Science, Suite 200, San Diego, Calif. 92128.

Referring generally to FIGS. **1**-**10**B, specific embodiments of a passive parabolic antenna **100** are described below. According to one embodiment, the passive parabolic antenna **100** includes a parabolic reflector **102** and a subscriber module pocket **104** approximately centered in the parabolic reflector **102**. The passive parabolic antenna **100** further includes a microwave feed assembly **106** configured for placement adjacent the subscriber module pocket **104**, wherein the microwave feed assembly **106** is configured to mate with a subscriber module antenna (see **200** in FIGS. **11**A-B and **12**) by forming a resonant cavity. The passive parabolic antenna **100** further includes an antenna cover **108** configured to mate with the parabolic reflector **102** and enclose the microwave feed assembly **106**.

According to another embodiment, the passive parabolic antenna **100** further includes an insert panel **110** for receiving the microwave feed assembly **106** and interfacing with the subscriber module pocket **104**. According to another embodiment of the passive parabolic antenna system **100**, the parabolic reflector **102** is formed of a plastic material having a metallic lining on an inner surface.

According to another embodiment of the passive parabolic antenna system **100**, the microwave feed assembly **106** further includes a patch antenna **111** configured to form part of a resonant cavity. According to this embodiment of the passive parabolic antenna system **100**, the microwave feed assembly **106** further includes a planar sheet of conductive material **112** connected to the patch antenna **111**. According to this embodiment of the passive parabolic antenna system **100**, the microwave feed assembly **106** further includes a linear conductive rod **114** connected at one end to the planar sheet of conductive material **112**. According to this embodiment of the passive parabolic antenna system **100**, the microwave feed assembly **106** further includes a dipole **116** connected to an opposite end of the linear conductive rod **114**.

According to yet another embodiment of the passive parabolic antenna system **100**, the subscriber module pocket **104** may be configured to receive a subscriber module radio antenna (see **200** in FIGS. **11**A-B and **12**). The fit between the subscriber module pocket **104** and subscriber module radio antenna **200** may be achieved through interference fit, secured by use of fasteners and even by use of a detent mechanism, according to various embodiments of the passive parabolic antenna system **100**. However, one of ordinary skill in the art with readily appreciate that the present invention is not limited to these specific means for securing the subscriber module pocket **104** to the subscriber module radio antenna **200**.

FIG. **13** is a flowchart of an embodiment of a method **300** of boosting signal strength of a conventional subscriber module radio antenna, according to the present invention. Method **300** may include providing **302** a passive parabolic antenna, e.g., passive parabolic antenna **100** as described above. The passive parabolic antenna may include a parabolic reflector **102**, a subscriber module pocket **104** approximately centered in the parabolic reflector **102**, a microwave feed assembly **106** configured for placement adjacent to the subscriber module pocket **104** and an antenna cover **108** configured to mate with the parabolic reflector **102** and enclose the microwave feed assembly **106**. Method **300** may further include sliding **304** the subscriber module pocket over the top of a subscriber module radio antenna.

According to another embodiment of method **300**, sliding **304** the subscriber module pocket **104** over the top of the subscriber module radio antenna **200** may achieve an interference fit between the subscriber module pocket **104** and the subscriber module radio antenna **200** (FIGS. **11**A-B). According to still another embodiment, method **300** may further include applying an adhesive on the outside of the top of the subscriber module radio antenna or the inside of the subscriber module pocket or both prior to sliding the subscriber module pocket over the top of the subscriber module radio antenna **200**.

According to yet another embodiment, method **300** may further include adjusting the aim of the passive parabolic antenna **100** toward a selected target to maximize signal gain. According to another embodiment, method **300** may further include providing an insert panel **110** for receiving the microwave feed assembly **106** and interfacing with the subscriber module pocket **104**. According to still another embodiment, method **300** may further include the parabolic antenna formed of a plastic material having a metallic lining on an inner surface.

Once the passive parabolic antenna **100** has been placed over the conventional subscriber module radio antenna **200**, it may appear as shown in FIGS. **12**A-B. FIGS. **12**A-B are perspective images of the embodiment of a passive parabolic antenna **100** (shown in FIGS. **1-10**B) as mounted on a conventional subscriber module radio antenna **200** (shown in FIGS. **11**A-B). Embodiments of the passive parabolic antenna **100** of the present invention may be used with any subscriber module antenna, at any suitable frequencies and powers of transmission.

FIG. **14** is a block diagram of an embodiment of a wireless communication system **400**, according to the present invention. System **400** may include a pair of wireless transceivers **402** directed at each other from a given distance. Each wireless transceiver **402** may include a subscriber module radio antenna **200** in communication with a passive parabolic antenna **100** as described herein. Each wireless transceiver **402** may further be configured for connection to a computer network **404**A and **404**B. The computer networks **404**A-**404**B may include Ethernet cabling. Though not shown, each subscriber module radio antenna **200** may also require connection to a power supply (not shown). Because of the increased signal gain achieved by the use of the passive parabolic antennas **100**, the given distance between the wireless transceivers **402** may be greater than if the subscriber module radio antennas **200** were used without the passive parabolic antennas **100**.

The passive parabolic antenna **100** of the present invention forms a resonant cavity coupling device that couples to the existing internal patch antenna of a conventional subscriber module radio antenna **200** (FIGS. **11**A-B). The combination of the passive parabolic antenna **100** of the present invention coupled to a conventional subscriber module radio antenna **200** (FIGS. **11**A-B), provides passive signal gain through a low-loss connection between the internal patch antenna of the subscriber module **200** and the passive parabolic antenna **100**.

Referring now to FIG. **15**, a diagrammatic view of resonant cavity coupling is shown, according to the present invention. The resonant cavity, shown generally at arrow **502**, may be found between a subscriber module patch antenna **500** within the subscriber module antenna **200** (FIGS. **11**A-B) and the patch antenna **111** of the microwave feed assembly **106** of the passive parabolic antenna **100** (not completely shown in FIG. **15**). According to the side view of the microwave feed assembly shown in FIG. **15**, the patch antenna **111** is adjacent to the planar sheet of conductive material **112**. The patch antenna **111** may be generally parallel to the planar sheet of conductive material **112**. The planar sheet of conductive material may be formed of a copper-clad printed circuit board. The planar sheet of conductive material **112** may be electrically connected to the outer surface **115** of the linear conductive rod **114**. An inner conductor **113** within the linear conductive rod **114** may be electrically connected to the patch antenna **111**. The inner conductor **113** may also be electrically connected to the dipole **116**. The dipole **116** may be electrically connected to the outer surface **115** of the linear conductive rod **114**.

While the foregoing advantages of the present invention are manifested in the illustrated embodiments of the invention, a variety of changes can be made to the configuration, design and construction of the invention to achieve those advantages. Hence, reference herein to specific details of the structure and function of the present invention is by way of example only and not by way of limitation.

What is claimed is:

1. A passive parabolic antenna, comprising:
- a parabolic reflector;
- a microwave feed assembly mounted to the parabolic reflector and configured to mate with a subscriber module antenna by forming a resonant cavity, the microwave feed assembly further comprising:
  - a patch antenna configured to form part of a resonant cavity;
  - a planar sheet of conductive material adjacent to the patch antenna;
  - a linear conductive rod connected at one end to the planar sheet of conductive material; and
  - a dipole connected to an opposite end of the linear conductive rod; and
- an antenna cover configured to mate with the parabolic reflector and enclose the microwave feed assembly.

2. The passive parabolic antenna according to claim **1**, wherein the parabolic reflector further comprises a plastic material having a metallic lining on an inner surface.

3. The passive parabolic antenna according to claim **1**, wherein the metallic lining comprises plasma arc coated metal.

4. The passive parabolic antenna according to claim **1**, wherein the metallic lining comprises adhesively secured metal foil.

5. The passive parabolic antenna according to claim **1**, further comprising a subscriber module pocket approximately centered in the parabolic reflector.

6. The passive parabolic antenna according to claim **5**, further comprising an insert panel for receiving the microwave feed assembly and interfacing with the subscriber module pocket.

7. The passive parabolic antenna according to claim **1**, wherein the patch antenna is further configured for connection to an inner conductor within the linear conductive rod.

8. The passive parabolic antenna according to claim **7**, wherein the inner conductor is further configured for connection to the dipole.

9. The passive parabolic antenna according to claim **1**, wherein the subscriber module pocket is configured to receive a subscriber module radio antenna.

10. The passive parabolic antenna according to claim **9**, wherein the subscriber module pocket is further configured to receive the subscriber module radio antenna in interference fit.

11. The passive parabolic antenna according to claim **10**, wherein the subscriber module pocket further comprises indentations configured to provide ramps inside the subscriber module pocket to achieve the interference fit with the subscriber module radio antenna.

12. The passive parabolic antenna according to claim **5**, wherein the subscriber module pocket is further configured to secure a subscriber module radio antenna using fasteners.

13. The passive parabolic antenna according to claim **5**, wherein the subscriber module pocket is further configured to secure a subscriber module radio antenna using a detent mechanism.

14. The passive parabolic antenna according to claim **1**, wherein the antenna cover comprises a dish having a flat portion.

15. The passive parabolic antenna according to claim **14**, wherein the antenna cover further comprises a metallic subreflector on an inside surface of the flat portion.

16. A method of boosting signal strength of a conventional subscriber module radio antenna, comprising:
- providing a passive parabolic antenna, comprising:
  - a parabolic reflector;
  - a microwave feed assembly placed at a focal point of the parabolic reflector, the microwave feed assembly further comprising:

a patch antenna configured to form part of a resonant cavity;

a planar sheet of conductive material adjacent to the patch antenna;

a linear conductive rod connected at one end to the planar sheet of conductive material; and

a dipole connected to an opposite end of the linear conductive rod; and

an antenna cover configured to mate with the parabolic reflector and enclose the microwave feed assembly; and

sliding the subscriber module pocket over the top of a subscriber module radio antenna.

17. The method according to claim **16**, further comprising a subscriber module pocket mounted approximately center of the parabolic reflector.

18. The method according to claim **16**, wherein sliding the subscriber module pocket over the top of the conventional subscriber module radio antenna comprises an interference fit between the subscriber module pocket and the subscriber module radio antenna.

19. The method according to claim **16**, further comprising applying an adhesive to the top of the subscriber module radio antenna, or an inside of the subscriber module pocket, or both, prior to sliding the subscriber module pocket over the top of the subscriber module radio antenna.

20. The method according to claim **16**, further comprising adjusting the aim of the passive parabolic antenna toward a selected target to maximize signal gain.

21. A wireless communications system, comprising:

a pair of wireless transceivers directed at each other, each wireless transceiver further comprising:

a subscriber module radio antenna; and

a passive parabolic antenna in communication with the subscriber module radio antenna, wherein the passive parabolic antenna comprises:

a parabolic reflector;

a microwave feed assembly located at a focal point of the parabolic reflector, the microwave feed assembly further comprising:

a patch antenna configured to form part of a resonant cavity;

a planar sheet of conductive material adjacent to the patch antenna;

a linear conductive rod connected at one end to the planar sheet of conductive material; and

a dipole connected to an opposite end of the linear conductive rod; and

an antenna cover configured to mate with the parabolic reflector and enclose the microwave feed assembly.

22. The wireless communications system according to claim **21**, further comprising a subscriber module pocket located approximately center of the parabolic reflector.

23. The wireless communications system according to claim **22**, wherein the passive parabolic antenna further comprises an insert panel for receiving the microwave feed assembly and interfacing with the subscriber module pocket.

24. The wireless communications system according to claim **21**, wherein the parabolic reflector further comprises a plastic material having a metallic lining on an inner surface.

25. The wireless communications system according to claim **22**, wherein the subscriber module pocket is configured to receive a subscriber module radio antenna.

26. The wireless communications system according to claim **25**, wherein the subscriber module pocket is further configured for interference fit with the subscriber module radio antenna.

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