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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/899,900	10/07/2010	Mark T. Montgomery	5000-0007	6726

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SkyCross Docket
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Weston, FL 33326

EXAMINER	
HU, JENNIFER F	

ART UNIT	PAPER NUMBER
2845	

NOTIFICATION DATE	DELIVERY MODE
05/29/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@ggip.com

Office Action Summary	Application No. 12/899,900	Applicant(s) MONTGOMERY ET AL.	
	Examiner JENNIFER F. HU	Art Unit 2845	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1 April 2014*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-27* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *16-27* is/are allowed.

7)☒ Claim(s) *1,3-9 and 11-15* is/are rejected.

8)☒ Claim(s) *2 and 10* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

The present application is being examined under the pre-AIA first to invent provisions.

Response to Arguments

Applicant's arguments with respect to claims 1-15 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Rejections to claims 1-27 under 35 U.S.C. 112, second paragraph are withdrawn based on the amendments to claims 1, 2, 10, 13, 15-17, 25 and 27.

Claim Rejections - 35 USC § 103

1. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4, 6, 7 and 12 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1) in view of Johnson et al. (US 2003/0189518 A1).

As to claim 1, Rutfors teaches a portable electronics device having a printed circuit board assembly (10, Fig. 1), an antenna system comprising:

a first antenna (20, Fig. 1) provided on the printed circuit board assembly, said first antenna being fed from a portion of the printed circuit board assembly such that a ground plane (10, Fig. 1) of the printed circuit board assembly serves as a counterpoise for the first antenna ("PCB 10 functions as a ground plane for a PIFA, the radiating element designated 20," [0023]); and

a second balanced antenna (230, Fig. 2) provided on the printed circuit board assembly, said second balanced antenna having dipole ends (231a, 231b, Fig. 2) to increase isolation between the first antenna and the second antenna ("The coupling between the PIFA antenna 20 and the balanced fed loop antenna 330 is low because the PIFA 20 gives an essentially electric field perpendicular to the antenna plane and the balanced fed loop antenna 330 gives an essentially magnetic field with direction perpendicular to the antenna plane. Therefore the antennas have low coupling between each other...alternatively the loop antenna 330 could be replaced with an open loop, i.e. a dipole antenna," col. 2, line 65 - col. 3, line 11).

Rutfors does not teach explicitly teach the dipole ends being excitable to an electrical potential of equal magnitude and opposite sign, resulting in an approximately neutral potential at the ground plane to approximately minimize coupling to the ground plane of the printed circuit board assembly.

Johnson teaches a dipole antenna (6, 8, Fig. 2), wherein the dipole ends are excitable to an electrical potential of equal magnitude and opposite sign, resulting in an approximately neutral potential at the ground plane (Fig. 4, "The signals emitted from the radiating elements are substantially equal in magnitude but out of phase by $360^{o}/N$, where N represents the number of antenna elements (i.e. two in this embodiment.) The antenna elements are arranged side-by-side and emit radiation that create a symmetric wave pattern, including a null along and near an axis of symmetry between the antenna elements," [0011]). The electromagnetic pattern of a dipole antenna as disclosed by Johnson is well known in the art and it would have been obvious to one of ordinary skill in the art that the dipole of Rutfors (231a, 231b, Fig. 2) would also yield a symmetrical antenna pattern comprising a null in the center of the ground plane, which would

minimize coupling with PIFA antenna 20, located at the center between the two dipole ends (231a, 231b, Fig. 2).

As to claim 4, Rutfors teaches the first antenna and the second balanced antenna are provided at the same end of the printed circuit board assembly (Fig. 2).

As to claim 6, Rutfors does not explicitly teach the second balanced antenna comprises a stamped metal part. However, forming antennas from stamped metal parts is well known as a low cost method of manufacturing antennas and would have been obvious to those of ordinary skill in the art.

As to claim 7, Rutfors teaches the second balanced antenna comprises two antenna pieces (231a, 231b, Fig. 2), each attached to an opposite side (right and left sides, Fig. 2) of the printed circuit board assembly.

As to claim 12, Rutfors does not teach said first antenna operates in a WiMAX frequency band and said second balanced antenna operates in a WiFi frequency band. However, tuning the antenna of Rutfors to a specific frequency band is within the skill of those of ordinary skill in the art, by common methods of adjusting matching circuits or adjusting the electrical length.

3. Claims 3, 8, 9 and 14 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1) in view of Johnson (US 2003/0189518 A1), further in view of Ollikainen (US 2007/0285319 A1).

As to claim 3, Rutfors does not teach the first antenna and the second balanced antenna are provided at opposite ends of the printed circuit board. Ollikainen teaches the first antenna (10, Fig. 1) and the second antenna (30, Fig. 1) are provided at opposite ends of the printed circuit board assembly. It would have been obvious to one of ordinary skill in the art to modify

the antenna of Rutfors by placing the first and second antennas at opposite end of a PCB in order to minimize coupling between the antennas.

As to claim 8, Rutfors does not teach of the two antenna pieces is soldered to a pad on opposite sides of the printed circuit board assembly, wherein the pads are connected to form an inductive connecting element. Ollikainen an antenna element having two ends on opposite sides of a printed circuit board (20, Fig. 1) connected to an inductive connecting element (40, Fig. 1) It would have been obvious to one of ordinary skill in the art to modify the antenna of Rutfors by including an inductive connecting element between the two ends of the antenna because the inductive connecting element provides an additional means of tuning the antenna to a resonant frequency without altering the physical size of the antenna.

As to claim 9, Rutfors teaches the second balanced antenna comprises a center fed dipole antenna (231a, 231b, Fig. 2) having capacitive end plates on opposite sides of the printed circuit board assembly. Rutfors does not teach said capacitive end plates being connected by an inductive connecting element. Ollikainen an antenna element having two ends on opposite sides of a printed circuit board (20, Fig. 1) connected to an inductive connecting element (40, Fig. 1) It would have been obvious to one of ordinary skill in the art to modify the antenna of Rutfors by including an inductive connecting element between the two ends of the antenna because the inductive connecting element provides an additional means of tuning the antenna to a resonant frequency without altering the physical size of the antenna.

As to claim 14, Rutfors does not teach one or more additional antennas attached to an edge of the printed circuit board assembly such that the ground plane of the printed circuit board assembly serves as a counterpoise for the one or more additional antennas.

Ollikainen teaches additional antennas attached to an edge of the printed circuit board assembly such that the ground plane serves as a counterpoise for the additional antenna (see [0045]). It would have been obvious to one of ordinary skill in the art to provide an additional unbalanced antenna to the antenna device of Rutfors in order to increase the diversity of the antenna system and provide an additional operating frequency.

4. Claims 5 and 11 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1) in view Johnson (US 2003/0189518 A1), further in view of Ali et al. (US 8,044,863 B2).

As to claim 5, Rutfors does not teach the second balanced antenna comprises a conductive foil pattern printed on a carrier attached to the printed circuit board assembly. Ali teaches an antenna comprising a conductive foil on a carrier attached to the printed circuit board assembly. It would have been obvious to one of ordinary skill in the art to modify the antenna if Rutfors by providing the antenna as a conductive foil pattern on a carrier because providing the dielectric carrier would provide additional isolation between the first and second antenna (see Rutfors, paragraph [0041] for example) or would allow the antenna to be reduced in length.

As to claim 11, Rutfors does not teach the second balanced antenna has a C-shaped cross section, and is disposed around an edge of the printed circuit board assembly. Ali teaches an antenna (40, Fig. 4) having a C-shaped cross section disposed around an edge of a printed circuit board (22, Fig. 4). It would have been obvious to one of ordinary skill in the art to modify the antenna if Rutfors as a C-shaped cross sectioned antenna upon a dielectric carrier. Providing the dielectric carrier would provide additional isolation between the first and second antenna (see Rutfors, paragraph [0041] for example) or would allow the antenna to be reduced in length, and

utilizing the C-shaped cross section around an edge of the PCB would reduce the height of the portable device (Ali, abstract).

5. Claim 13 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1) in view Johnson (US 2003/0189518 A1), further in view of Bell (US 5,189,434).

As to claim 13, Rutfors does not teach the second balanced antenna comprising a plurality of antenna elements, each operatively coupled to a different antenna port, and one or more connecting elements electrically connecting the antenna elements such that electrical currents on one antenna element flow to a connected neighboring antenna element and generally bypass the antenna port coupled to the neighboring antenna element, the electrical currents flowing through the one antenna element and the neighboring antenna element being generally equal in magnitude, such that an antenna mode excited by one antenna port is generally electrically isolated from a mode excited by another antenna port at a given desired signal frequency range.

Bell teaches a multimode antenna structure comprising:

a plurality of antenna ports operatively coupled to the circuitry (col 12, In 17-20);

a plurality of antenna elements (col 3, lines 27- 29), each operatively coupled to a different one of the antenna ports [terminal] (col 2, lines 32-37); and

one or more connecting elements electrically connecting the antenna elements such that electrical currents on one antenna element flow to a connected neighboring antenna element and generally bypass the antenna port coupled to the neighboring antenna element, the electrical currents flowing through the one antenna element and the neighboring antenna element being

generally equal in magnitude (Fig. 6-9), such that an antenna mode excited by one antenna port is generally electrically isolated from a mode excited by another antenna port at a given desired signal frequency range (abstract).

It would have been obvious to one of ordinary skill in the art to modify the antenna structure of Rutfors by providing a multimode antenna structure as taught by Bell in order to increase the diversity of the antenna system and allow the system to operate in additional bandwidths.

Allowable Subject Matter

Claims 2 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, amending claim 10 to claim 1 would comprise the same subject matter as independent claim 16.

Regarding claim 2, the prior art does not teach the antenna system as claimed in claim 1, wherein the dipole ends are oriented such that the axis of polarization is approximately normal to the ground plane.

Regarding claim 10, the prior art does not teach the antenna system as claimed in claim 1, wherein the second balanced antenna comprises two approximately symmetrical dipole ends positioned approximately equidistant from the printed circuit board assembly on opposite sides of the printed circuit board assembly.

The pertinent prior art, when taken alone, or, in combination, cannot be reasonably construed as adequately teaching the elements and features of the claimed invention as arranged, disposed, or provided in the manner as claimed by the Applicants,".

Claims 16-27 are allowed, as indicated in the Non-Final Rejection dated January 29, 2014.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER F. HU whose telephone number is (571)272-5486. The examiner can normally be reached on Monday-Friday 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dameon Levi can be reached on (571) 272-2105. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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