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**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.

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### **DETAILED ACTION**

1. Acknowledgement is made of applicant's amendment filed December 20, 2012. Pending claims for reconsideration are claims 1-32. Claims 5, and 18 have been amended. Applicant's amendments have been fully considered and a detailed response follows.

#### ***Drawings***

2. Figures 1A-1G should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1 - 3, 8, 14 and 27 are rejected** under 35 U.S.C. 102(b) as being anticipated by Bell (5,189,434).

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4. **Regarding claims 1, 14 and 27**, Bell discloses a multimode antenna structure for transmitting and receiving electromagnetic signals in a communications device, the communications device including circuitry for processing signals communicated to and from the antenna structure, the antenna structure comprising: a plurality of antenna ports for coupling to the circuitry (col 12, Ln 17-20); a plurality of antenna elements (col 3, Ln 27-29), each operatively coupled to a different one of the antenna ports [terminal] (col 2, Ln 32-37); a plurality of connecting elements, each electrically connecting neighboring antenna elements (Col. 3, Ln 6 – 14) such that the antenna elements and the connecting elements are arranged about the periphery of the antenna structure and form a single radiating structure (see Fig. 2A and 2B), wherein electrical currents on one antenna element flow to a connected neighboring antenna element and generally bypass the antenna port coupled to the neighboring antenna elements (Col. 5, Ln. 46 – 50), 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 and the antenna elements generate diverse antenna patterns (abstract).

5. **Regarding claim 2**, Bell discloses the antenna structure of claim 1 and further discloses that the plurality of antenna elements comprises three antenna elements (see Fig. 2b, Arms 1 – 3) and the plurality of connecting elements comprises three connecting elements (see Fig. 2b, each arm has a connecting element).

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6. **Regarding claim 3**, Bell discloses the antenna structure of claim 1 and further discloses that the antenna elements are balanced by a common counterpoise (Col. 2, Ln. 37 - 40).

7. **Regarding claim 8**, Bell discloses the antenna structure of claim 1 and further discloses that each of the connecting elements has a tortuous configuration to provide a given electrical length (see Fig. 6).

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 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 negated by the manner in which the invention was made.

9. **Claims 4 - 7 are rejected** under 35 U.S.C. 103(a) as being unpatentable over Bell (5,189,434) in view of Goubau (US 3,967,276).

10. **Regarding claim 4**, Bell discloses the antenna structure of claim 3 but does not disclose that the common counterpoise is a hollow conductive cylinder.

However, Goubau discloses a similarly structured antenna wherein the common counterpoise is a hollow conductive cylinder (16, Fig. 4). Goubau teaches use of the hollow conductor to facilitate feeding (Col. 3, Ln. 28 - 29).

Therefore, it would have been obvious to one of ordinary skill in the art to use a cylindrical counterpoise in the antenna structure of Bell as taught in Goubau to provide

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space for the input cable to be directed toward the antenna element. Such modification would have been obvious to achieve the antenna of claim 1.

11. **Regarding claims 5 - 7**, Goubau, as applied to Bell in claim 4, further discloses that the antenna ports are coupled to a cable extending through the cylinder (see Fig. 4, input terminal extends through the counterpoise 16).

12. **Claims 9 – 11 are rejected** under 35 U.S.C. 103(a) as being unpatentable over Bell (5,189,434) in view of Ho (US PG Pub. No. 2006/0050009).

13. **Regarding claims 9 and 10**, Bell discloses the antenna structure of claim 1 but does not disclose that the structure is constructed from a flexible printed circuit packaged in a plastic enclosure.

However, Ho discloses the communications device is a cellular handset, PDA, wireless networking device, or a data card for PC (Para [0004]) and a multimode antenna structure comprises a structure fabricated on a printed circuit board substrate (Para [0025]). It would have been obvious to one of ordinary skill in the art to provide a multimode antenna structure for transmitting and receiving electromagnetic signals as taught by Bell and to provide a structure fabricated on a printed circuit board because it would permit the antenna structure to be connected within a plurality of electronic devices through use of various conductive pathways located on the printed circuit board.

14. **Regarding claims 11**, Bell discloses the antenna structure of claim 1 but does not disclose traces placed on the circuit boards.

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However, Ho discloses the communications device is a cellular handset, PDA, wireless networking device, or a data card for PC (Para [0004]) and a multimode antenna structure comprises a structure fabricated on a printed circuit board substrate (Para [0025]). It would have been obvious to one of ordinary skill in the art to provide a multimode antenna structure for transmitting and receiving electromagnetic signals as taught by Bell and to provide a structure fabricated on a printed circuit board because it would permit the antenna structure to be connected within a plurality of electronic devices through use of various conductive pathways located on the printed circuit board.

15. **Claims 14 – 20 and 27 are rejected** under 35 U.S.C. 103(a) as being unpatentable over Goubau (US 3,967,276).

16. **Regarding claims 14 and 27**, Goubau discloses a multimode antenna structure for transmitting and receiving electromagnetic signals in a communications device, the communications device including circuitry for processing signals communicated to and from the antenna structure (Fig. 4), the antenna structure comprising a plurality of antenna ports for coupling to the circuitry (see Fig. 4, points at apex of radiating elements 17 and 19); a plurality of radiating elements (17 and 19, Fig. 4), each operatively coupled to a different one of the antenna ports (see Fig. 4), the plurality of antenna elements arranged around the periphery of the antenna structure (see Fig. 4, elements around periphery); and a connecting element electrically connecting the antenna elements to a common point to form a single radiating structure (see Fig. 4, connecting element between radiating elements 17).

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Although Goubau does not explicitly disclose that the electrical currents on one antenna element flow to another antenna element and generally bypass the antenna port coupled to the another antenna element; it does teach the structure of the claim 1 (see MPEP 2112.01, “where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2114, “while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997)). Thus it would have been obvious to one of ordinary skill in the art that Goubau teaches the limitations of claim 1 including that the 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, and the antenna structure generates diverse antenna patterns.

17. **Regarding claims 15**, Goubau discloses the antenna of claim 14 and further discloses that the plurality of antenna elements comprises four antenna elements (see Fig. 4).

18. **Regarding claim 16**, Goubau discloses the antenna of claim 14 and further discloses that the antenna elements are balanced by a common counterpoise (16, Fig. 4).



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19. **Regarding claims 17 - 20**, Goubau discloses the antenna of claim 16 and further discloses that the common counterpoise comprises a hollow conductive cylinder with a cable extending through the cylinder (16, Fig. 4).

20. **Claims 21 – 24 and 30 - 32 are rejected** under 35 U.S.C. 103(a) as being unpatentable over Goubau (US 3,967,276) in view of Ho (2006/0050009).

21. **Regarding claims 21—24 and 30 - 32**, Goubau discloses the antenna structure of claims 14 and 27 but does not disclose traces placed on the circuit boards.

However, Ho discloses the communications device is a cellular handset, PDA, wireless networking device, or a data card for PC (Para [0004]) and a multimode antenna structure comprises a structure fabricated on a printed circuit board substrate (Para [0025]). It would have been obvious to one of ordinary skill in the art to provide a multimode antenna structure for transmitting and receiving electromagnetic signals as taught by Bell and to provide a structure fabricated on a printed circuit board because it would permit the antenna structure to be connected within a plurality of electronic devices through use of various conductive pathways located on the printed circuit board.

22. **Claims 28 and 29 are rejected** under 35 U.S.C. 103(a) as being unpatentable over Goubau (US 3,967,276) in view of Bell (US 5,189,434).

23. **Regarding claims 28 and 29**, Bell discloses the antenna structure of claim 1 and further discloses that each of the connecting elements has a tortuous configuration to provide a given electrical length (see Fig. 6).

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It would have been obvious to one of ordinary skill in the art to modify the antenna of Goubau with the tortuous configuration of Bell to provide enhanced performance and increase length as shown in Figure 6.

***Allowable Subject Matter***

24. **Claims 12 - 13, 25, 26 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.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KYANA R. ROBINSON whose telephone number is (571)270-7918. The examiner can normally be reached on M- Th 7:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacob Y. Choi can be reached on 571-272-2367. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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KRR

/HOANG V NGUYEN/  
Primary Examiner, Art Unit 2821