

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas - Marshall Division on the following

☐ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 2:24-cv-00009	DATE FILED 1/8/2024	U.S. DISTRICT COURT for the Eastern District of Texas - Marshall Division
PLAINTIFF PROCOMM INTERNATIONAL PTE. LTD.		DEFENDANT VERIZON COMMUNICATIONS, INC., CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS, et al
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,583,100 B2	11/12/2013	PROCOMM INTERNATIONAL PTE. LTD.
2 7,103,377 B2	9/5/2006	PROCOMM INTERNATIONAL PTE. LTD.
3 7,834,721 B2	11/16/2010	PROCOMM INTERNATIONAL PTE. LTD.
4 8,497,813 B2	7/30/2013	PROCOMM INTERNATIONAL PTE. LTD.
5 7,724,512 B2	5/25/2010	PROCOMM INTERNATIONAL PTE. LTD.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT		
CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/792,367	07/30/2013	8497813	7836-107560-CIP	4588

24628 7590 07/10/2013
Husch Blackwell LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 570 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Derek RODGER, Inverkeithing, UNITED KINGDOM;
Matthew FERRIS, Plano, TX;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24628 7590 05/08/2013
Husch Blackwell LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/792,367	06/02/2010	Derek RODGER	7836-107560-CIP	4588

TITLE OF INVENTION: PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1780	\$300	\$0	\$2080	08/08/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
PHAN, THO GIA	2821	343-872000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 Husch Blackwell LLP
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

Andrew LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Hickory, North Carolina

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 25-0920 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

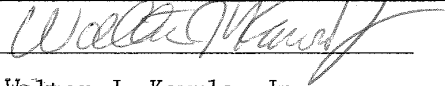
NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature



Date 26 JUNE 2013

Typed or printed name

Walter J. Kawula, Jr.

Registration No. 39,724

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Patent Application Fee Transmittal				
Application Number:		12792367		
Filing Date:		02-Jun-2010		
Title of Invention:		PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE		
First Named Inventor/Applicant Name:		Derek RODGER		
Filer:		Walter J. Kawula Jr./Catherine Fascetta		
Attorney Docket Number:		7836-107560-CIP		
Filed as Large Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	1780	1780
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2080

Electronic Acknowledgement Receipt	
EFS ID:	16164334
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Walter J. Kawula Jr./Catherine Fascetta
Filer Authorized By:	Walter J. Kawula Jr.
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	26-JUN-2013
Filing Date:	02-JUN-2010
Time Stamp:	17:29:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$2080
RAM confirmation Number	5156
Deposit Account	230920
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	PTOL85-PartB-FeeTransmittal-7836-107560-CIP.pdf	189248 790d3d5d35fbd7042a00b349a2c37796b586009	no	2

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	32181 01378df8a631dbcaafc6ba4fe752fb308eb5205d	no	2
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Warnings:

Information:

Total Files Size (in bytes):	221429
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

24628 7590 05/08/2013
Husch Blackwell LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606

EXAMINER

PHAN, THO GIA

ART UNIT

PAPER NUMBER

2821

DATE MAILED: 05/08/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/792,367	06/02/2010	Derek RODGER	7836-107560-CIP	4588

TITLE OF INVENTION: PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1780	\$300	\$0	\$2080	08/08/2013

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24628 7590 05/08/2013
Husch Blackwell LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/792,367	06/02/2010	Derek RODGER	7836-107560-CIP	4588

TITLE OF INVENTION: PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1780	\$300	\$0	\$2080	08/08/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
PHAN, THO GIA	2821	343-872000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev. 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

- 1 _____
- 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/792,367	06/02/2010	Derek RODGER	7836-107560-CIP	4588
24628	7590	05/08/2013	EXAMINER	
Husch Blackwell LLP Husch Blackwell Sanders LLP Welsh & Katz 120 S RIVERSIDE PLAZA 22ND FLOOR CHICAGO, IL 60606			PHAN, THO GIA	
			ART UNIT	PAPER NUMBER
			2821	

DATE MAILED: 05/08/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 512 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 512 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 12/792,367	Applicant(s) RODGER ET AL.	
	Examiner THO G. PHAN	Art Unit 2821	AIA (First Inventor to File) Status No

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to a response filed on 4/29/13.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ 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.

3. ☒ The allowed claim(s) is/are 1-7 and 9-18. As a result of the allowed claim(s), 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.

4. ☐ 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)).
* Certified copies not received: _____.

Interim copies:
a) ☐ All b) ☐ Some c) ☐ None of the: Interim copies of the priority documents have been received.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	

/THO G PHAN/ Primary Examiner, Art Unit 2821	
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DETAILED ACTION

Allowable Subject Matter

1. The following is a statement of reasons for the indication of allowable subject matter:
Claim 1 is allowable over the art of record because the prior art does not teach wherein a flange joins the first and second side walls and the top and bottom wall, and a lip extends from the flange, further defining the aperture through which the cavity of the enclosure may be accessed, the lip being engaged by the internal cover to provide the environmental seal and in combination with the remaining claimed limitations.
2. Claim 9 is allowable over the art of record because the prior art does not teach at least one passive radio element mounted inside the passive radio enclosure; wherein the active radio enclosure and internal cover provide environmental sealing and electromagnetically shielding for the active radio component; and wherein the internal cover is mounted to the active radio enclosure by a hinge, so that the active radio components may be accessed without disturbing the location of the radome or RF modules with respect to the internal cover and in combination with the remaining claimed limitations.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tho G. Phan whose telephone number is 571-272-1826. The examiner can normally be reached on M-F, 6:30-3:00.

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).

/Tho G Phan/
Primary Examiner, Art Unit 2821



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 4588

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
12/792,367	06/02/2010	343	2821	7836-107560-CIP		
APPLICANTS Derek RODGER, Inverkeithing, UNITED KINGDOM; Matthew FERRIS, Plano, TX; ** CONTINUING DATA ***** This application is a CIP of PCT/US09/66345 12/02/2009 which claims benefit of 61/119,114 12/02/2008 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 06/15/2010						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/THO GIA PHAN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY UNITED KINGDOM	SHEETS DRAWINGS 10	TOTAL CLAIMS 8	INDEPENDENT CLAIMS 1
ADDRESS Husch Blackwell LLP Husch Blackwell Sanders LLP Welsh & Katz 120 S RIVERSIDE PLAZA 22ND FLOOR CHICAGO, IL 60606 UNITED STATES						
TITLE PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE						
FILING FEE RECEIVED 1220	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S20	5	("20070001919" "20080252552" "20060109188" "20050104792" "20060250311").PN.	US-PGPUB; USPAT	OR	ON	2013/05/01 15:31
S21	2	((DEREK) near2 (RODGER)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/05/01 15:31
S22	13411753	housing or radome or cover or enclosure or cas\$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/05/01 15:32
S23	806437	antenna or (radiating with module)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/05/01 15:32
S24	178655	heat with sink	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/05/01 15:32
S25	2288806	panel	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/05/01 15:33
S26	1744819	flange	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/05/01 15:33
S27	12	S22 S23 S24 S25 S26	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	SAME	ON	2013/05/01 15:34
S28	27	S22 S23 S24 S26	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	SAME	ON	2013/05/01 15:34
S29	636	S22 S23 S24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	SAME	ON	2013/05/01 15:35
S30	50	S22 S23 S24 S25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	SAME	ON	2013/05/01 15:36
S31	67	S25 S26 S29	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/05/01 15:37
S32	823485	hinge	US-PGPUB; USPAT;	AND	ON	2013/05/01

EAST Search History

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			15:39
S33	78	S29 S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/05/01 15:40
S34	2	(panel and antenna and cavity and cover and heat and seal).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/05/01 15:40
S35	11420	343/702	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/05/01 15:40
S36	2848	343/872	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/05/01 15:41

5/ 4/ 2013 10:38:27 AM

C:\Users\tphan1\Documents\EAST\Workspaces\12-792,367.wsp

Issue Classification 	Application/Control No. 12792367	Applicant(s)/Patent Under Reexamination RODGER ET AL.
	Examiner THO G PHAN	Art Unit 2821

CPC					
Symbol				Type	Version

CPC Combination Sets					
Symbol			Type	Set	Ranking

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION										
CLASS		SUBCLASS				CLAIMED					NON-CLAIMED					
343		872				H	0	1	Q	1 / 42 (2006.01.01)						
CROSS REFERENCE(S)																
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)															
343	702															

NONE		Total Claims Allowed:	
		17	
(Assistant Examiner)	(Date)		
/THO G PHAN/ Primary Examiner. Art Unit 2821	5/4/13	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

Issue Classification 	Application/Control No. 12792367	Applicant(s)/Patent Under Reexamination RODGER ET AL.
	Examiner THO G PHAN	Art Unit 2821

NONE		Total Claims Allowed:	
		17	
(Assistant Examiner)	(Date)		
/THO G PHAN/ Primary Examiner. Art Unit 2821	5/4/13	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

Issue Classification 	Application/Control No. 12792367	Applicant(s)/Patent Under Reexamination RODGER ET AL.
	Examiner THO G PHAN	Art Unit 2821

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	16	17												
2	2	17	18												
3	3														
4	4														
5	5														
6	6														
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9	10														
10	11														
11	12														
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13	14														
14	15														
15	16														

NONE		Total Claims Allowed:	
		17	
(Assistant Examiner)	(Date)		
/THO G PHAN/ Primary Examiner. Art Unit 2821	5/4/13	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

-PATENT-
Date: April 29, 2013

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:	)	Confirmation No. 4588
Derek RODGER et al.	)	
Serial No.: 12/792,367	)	Group No.: 2821
Filed: June 2, 2010	)	Examiner: Tho Gia PHAN
For: PANEL ANTENNA HAVING SEALED	)	
RADIO ENCLOSURE	)	
Attorney	)	
Docket No.: 7836-107560-CIP	)	

REPLY AND AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

This is in Reply to the Official Communication mailed on January 28, 2013 in the above-referenced application. Applicants respectfully request reconsideration and/or further examination.

CHI-20562-1

IN THE CLAIMS:

1. (currently amended) A panel antenna, comprising:

an enclosure, the enclosure including a rear panel, a first side wall, and a second side wall, a top wall and a bottom wall, the rear panel and the walls defining a cavity, the walls further defining an aperture through which the cavity of the enclosure may be accessed,

an internal cover, the internal cover being dimensioned to overlap an area defined by the aperture of the enclosure and providing an environmental seal and electromagnetic shielding for the cavity, the internal cover having at least one RF radiating module fastened to an exterior surface thereof,

at least one micro radio mounted to an internal surface of the first side wall, the micro radio being coupled to the RF radiating module;

a first heat sink, mounted to an external surface of the first side wall, and

a radome, the radome mounting to the internal cover and enclosing the RF radiating module[.];

wherein a flange joins the first and second side walls and the top and bottom wall, and a lip extends from the flange, further defining the aperture through which the cavity of the enclosure may be accessed, the lip being engaged by the internal cover to provide the environmental seal.

2. (original) The panel antenna of claim 1, wherein the panel antenna further comprises: a second micro radio, the second micro radio mounted to an internal surface of the second side wall, a plurality of RF radiating modules, a second heat sink mounted on an exterior surface of the second side wall.
3. (original) The panel antenna of claim 2, wherein each RF radiating element is dual polarized and is associated with two micro radios.
4. (original) The panel antenna of claim 1, further comprising a communications hub coupled to each micro radio.
5. (original) The panel antenna of claim 4, further comprising a calibration radio.
6. (currently amended) The panel antenna of claim 5, wherein the communications hub and calibration radio are mounted on an interior surface of the rear panel, and a ~~third~~ rear heat sink is mounted on an exterior surface of the rear panel.
7. (original) The panel antenna of claim 1, wherein a flange joins the first and second side walls and the top and bottom wall, further defining the aperture through which the cavity of the enclosure may be accessed.

Claim 8 is canceled.

9. (new) A cellular base station antenna, comprising:

an active radio enclosure, the active radio enclosure including a rear panel, a first side wall, and a second side wall, a top wall and a bottom wall, the rear panel and the walls defining a cavity, the walls further defining an aperture through which the cavity of the active radio enclosure may be accessed;

at least one active radio component mounted inside the cavity, on the rear panel;

a heat sink mounted on an external surface of the rear panel;

an internal cover mounted to the aperture, the internal cover being dimensioned to overlap an area defined by the aperture of the active radio enclosure;

a passive radio enclosure including a radome, the passive radio enclosure being defined by the radome and an exterior surface of the internal cover; and

at least one passive radio element mounted inside the passive radio enclosure;

wherein the active radio enclosure and internal cover provide environmental sealing and electromagnetically shielding for the active radio component; and

wherein the internal cover is mounted to the active radio enclosure by a hinge, so that the active radio components may be accessed without disturbing the location of the radome or RF modules with respect to the internal cover.

10. (new) The cellular base station antenna of claim 9, wherein the active radio component further comprises a micro radio and the passive radio element comprises a RF module.

11. (new) The cellular base station antenna of claim 9, wherein the active radio component further comprises at least two micro radios and the passive radio element comprises a dual polarized RF module, wherein a first micro radio is coupled to a first radiating element of the dual polarized RF module, and a second micro radio is coupled to a second radiating element of the dual polarized RF module.

12. (new) The cellular base station antenna of claim 9, wherein the active radio component further comprises a plurality of micro radios and the passive radio element comprises a plurality of RF modules.

13. (new) The cellular base station antenna of claim 9, wherein the internal cover is fabricated from a sheet of aluminum.

14. (new) The panel cellular base station antenna of claim 9, wherein the active radio component further comprises:

- a micro radio,
- a communications hub coupled to the micro radio, and
- a calibration radio.

15. (new) The panel cellular base station antenna of claim 9, further comprising a plurality of micro radios mounted on the first side wall and the second side wall, and wherein the active radio component further comprises a communications hub coupled to the micro radios.

16. (new) The cellular base station antenna of claim 9, wherein the passive radio component further comprises a plurality of RF modules mounted to the outer surface of the internal cover.

17. (new) The cellular base station antenna of claim 9, wherein a flange joins the first and second side walls and the top and bottom wall, and a lip extends from the flange, further defining the aperture through which the cavity of the enclosure may be accessed, the lip being engaged by the internal cover to provide the environmental seal.

18. (new) The cellular base station antenna of claim 9, wherein the radome of the passive radio enclosure does not provide environmental sealing or electromagnetic shielding for the passive radio element

REMARKS

Claims 1-8 were pending prior to the present amendment. Claims 1-7 stand rejected, and claim 8 stands objected to. Claim 8 is canceled and claims 9-18 are added by amendment. Accordingly, claims 1-7 and 9-18 are at issue.

Claim 6 stands rejected under 35 U.S.C. §112 as indefinite. Claim 6 is amended to recite a rear heat sink instead of a third heat sink. Accordingly, it is believed that the rejection is resolved.

Claims 1-7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bishop (US 2006/0250311) in view of Harner (US 3,495,173). Withdrawal of the rejection is requested in view of the amendment to claim 1, and for reasons set forth below.

It is not conceded that the rejection of claim 1 based on the documents cited is appropriate. However, to expedite allowance of the application, Claim 1 is currently amended to include the subject matter of claim 8. In the present office action, claim 8 is deemed allowable if re-written in independent form. Accordingly, it is believed that claim 1, as now amended to include the subject matter of claim 8 in independent form, is allowable. Also, all claims which depend from claim 1 are allowable for at least the same reasons.

New claims 9-18 are added by amendment. Independent claim 9 is believed allowable over the cited documents because, among other things, claim 9 recites that the internal cover is mounted to the active radio enclosure by a hinge, so that the active radio components may be accessed without disturbing the location of the radome or RF modules with respect to the internal cover. Such structure is not shown or made obvious by the cited documents. Accordingly, claims 9-18 are also believed allowable.

The Commissioner is hereby authorized to charge any additional fee which may be required for this application under 37 C.F.R. § 1.16-1.18, including but not limited to the issue fee, or credit any overpayment, to Deposit Account No. 23-0920.

Should no proper amount be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 23-0920.

Respectfully submitted,

HUSCH BLACKWELL LLP

By 
Walter J. Kawula, Jr.
Registration No. 39,724

Date: April 29, 2013

HUSCH BLACKWELL LLP
120 South Riverside Plaza – Suite 2200
Chicago, Illinois 60606
Phone: (312) 655-1500
Fax: (312) 655-1501

Electronic Acknowledgement Receipt	
EFS ID:	15634458
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Walter J. Kawula Jr./Catherine Fascetta
Filer Authorized By:	Walter J. Kawula Jr.
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	29-APR-2013
Filing Date:	02-JUN-2010
Time Stamp:	13:00:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	ReplyAndAmendment-7836-10 7560-CIP.pdf	500393 46986bc0a780e192e1d8dd81ba7f1af8b507a179	no	8
Warnings:					
Information:					

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 12/792,367		Filing Date 06/02/2010		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED – PART I									
(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A		N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =		*		X \$ =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$ =			
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
APPLICATION AS AMENDED – PART II									
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	04/29/2013		CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))		* 17		Minus	** 20	= 0		
	Independent (37 CFR 1.16(h))		* 2		Minus	*** 3	= 0		
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						RATE (\$)		ADDITIONAL FEE (\$)	
						X \$80 =		0	
						X \$420 =		0	
						TOTAL ADD'L FEE		0	
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))		*		Minus	**	=		
	Independent (37 CFR 1.16(h))		*		Minus	***	=		
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						RATE (\$)		ADDITIONAL FEE (\$)	
						X \$ =			
						X \$ =			
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

LIE
/MARISSA BLYTHER/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/792,367	06/02/2010	Derek RODGER	7836-107560-CIP	4588
24628	7590	01/28/2013		
Husch Blackwell LLP Husch Blackwell Sanders LLP Welsh & Katz 120 S RIVERSIDE PLAZA 22ND FLOOR CHICAGO, IL 60606			EXAMINER PHAN, THO GIA	
			ART UNIT 2821	PAPER NUMBER
			MAIL DATE 01/28/2013	DELIVERY MODE PAPER

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.

Office Action Summary	Application No.	Applicant(s)	
	12/792,367	RODGER ET AL.	
	Examiner	Art Unit	
	THO G. PHAN	2821	

-- 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 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, 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 02 June 2010.
- 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) 1-8 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-7 is/are rejected.
- 8) ☒ Claim(s) 8 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 02 June 2010 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).
- a) ☐ All b) ☐ Some c) ☐ None of:
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) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>7/27/12, 6/28/12, 6/30/11, 2/10/11, 7/21/10</u> . | 4) ☐ Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 6, line 2, the language, “a third heat sink” lacks a proper antecedent basis, the claims it depends on do not define a first/second heat sink.

Claim Rejections - 35 USC § 103

3. 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.

4. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop (US 2006/0250311 A1) [cited by applicant] in view of Harner et al (3,495,173).

Bishop discloses an enclosure 102 including a rear panel, a first side wall, and a second side wall, a top wall and a bottom wall, the rear panel and the walls defining a cavity (figure 1), the walls further defining an aperture through which the cavity of the enclosure may be accessed an internal cover 106, the internal cover being dimensioned to overlap an area defined by the aperture of the enclosure and providing an environmental seal (via lip 314, figure 3) and

electromagnetic shielding (via conductive ground plane 306) for the cavity, the internal cover having at least one RF radiating module 308,310 fastened to an exterior surface thereof, at least one micro radio 304 mounted inside the enclosure, the micro radio being coupled to the RF radiating module; and a radome 312 mounting to the internal cover and enclosing the RF radiating module (figures 1-5).

Bishop had been discussed but fails to teach first/second micro radio mounted to an internal surface of the side walls; a first/second/third heat sink mounted to an external surface of the side walls; communications hub and calibration radio. However, Harner et al teach micro radio mounted to an internal surface of the side wall (figure 9); heat sinks 69 mounted to an external surface of the side walls and communications hub 78. It would have been obvious to provide Bishop with first/second micro radio mounted to an internal surface of the side walls; a first/second/third heat sink mounted to an external surface of the side walls; communications hub and calibration radio for the purpose of enabling heat to be dissipated from electronic components sealed within the enclosure so as to improve the antenna gain.

Allowable Subject Matter

5. Claims 8 is 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

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The patents to Patel, Bambridge et al., Pande et al. and Suzuki et al. are cited as of interested and illustrated a similar structure to an antenna device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tho G. Phan whose telephone number is 571-272-1826. The examiner can normally be reached on M-F, 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacob Choi can be reached on (571) 272-2367. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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).

/THO G PHAN/
Primary Examiner, Art Unit 2821

Application/Control Number: 12/792,367
Art Unit: 2821

Page 5

Notice of References Cited	Application/Control No. 12/792,367	Applicant(s)/Patent Under Reexamination RODGER ET AL.	
	Examiner THO G. PHAN	Art Unit 2821	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-3,495,173 A	02-1970	HARNER ROBERT H et al.	324/127
*	B	US-5,828,339 A	10-1998	Patel, Mineshkumar R.	343/700MS
*	C	US-6,259,933 B1	07-2001	Bambridge et al.	455/557
*	D	US-2002/0065052 A1	05-2002	Pande et al.	455/67.5
*	E	US-6,414,867 B2	07-2002	Suzuki et al.	363/141
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Receipt date: 06/30/2011

12792367 - GAU: 2821

PTO/SB/08A & PTO/SB/08B (10-01)

Approved for use through 10/31/2002. OMB 0651-0031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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10/24/2001 W&K Substitute for Form PTO-SB/08A, which is a US PTO Substitute for form 1449A/PTO and 1449B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(use as many sheets as necessary)</i>		Complete if Known	
		Application Number	12/792,367
		Filing Date	June 2, 2010
		First Named Inventor	Derek RODGER
		Art Unit	2821
		Examiner Name	n/a
Sheet 1	of 1	Attorney Docket Number	107560-CIP

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. 1	Document Number Number - Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US 2007-0001919 A1	01/04/2007	Niallo Carroll et al	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		WO 2009-011601 A1	01/22/2009	Times-7 Holding Limited et al.		

OTHER ART - NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ⁶
		Written Opinion for related case PCT/US2009/066345.	

Examiner Signature	/Tho Phan/ (01/25/2013)	Date Considered	
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¹Applicant's unique citation designation number (optional). ²See Kind Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³Enter Office that issued the document, by the two-letter code (WIPO Standard ST. 3). ⁴For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶Applicant is to place a check mark here if English language Translation is attached.

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Receipt date: 02/10/2011

12792367 - GAU: 2821

PTO/SB/08a (07-09)

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Substitute for form 1449/PTO		Complete if Known	
		Application Number	12/792,367
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)		Filing Date	2 June 2010
		First Named Inventor	RODGER
		Art Unit	2821
		Examiner Name	To be assigned
		Attorney Docket Number	7836-107560-CIP
Sheet	1	of	2

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
		US- 2005-0104792 A1	05-19-2005	ASAO et al.	
		US- 2006-0109188 A1	05-25-2006	IKEDA et al.	
		US-			
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Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T ⁶
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)				
		WO 2006-119454 A1	11-09-2006	MEDIACELL LICENSING		
		WO 2005-069432 A1	07-28-2005	FCI et al.		

Examiner Signature	/Tho Phan/ (01/25/2013)	Date Considered	
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12792367 - GAU: 2821

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		Application Number	12/792,367
		Filing Date	2 June 2010
		First Named Inventor	RODGER
		Art Unit	2821
		Examiner Name	To be assigned
Sheet 2	of 2	Attorney Docket Number	7836-107560-CIP

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		Copy of International Search Report and Written Opinion regarding PCT/US2010/03788 undated	
		Copy of International Search Report and Written Opinion regarding PCT/US2009/066345 undated	

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<i>Search Notes</i> 	Application/Control No. 12792367	Applicant(s)/Patent Under Reexamination RODGER ET AL.
	Examiner THO G PHAN	Art Unit 2821

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
343	700,702,872,873	1/25/2013	tp

SEARCH NOTES		
Search Notes	Date	Examiner
see history attached	1/25/2013	tp

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
see history attached	see history attached	1/25/2013	tp

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	"20110032158"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/01/25 11:42
S2	5	("20070001919" "20080252552" "20060109188" "20050104792" "20060250311").PN.	US-PGPUB; USPAT	OR	ON	2013/01/25 11:44
S3	2	((DEREK) near2 (RODGER)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2013/01/25 11:44
S4	6682063	housing or radome or cover	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/01/25 11:45
S5	6877294	housing or radome or cover or enclosure	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/01/25 11:46
S6	787383	antenna or (radiating with module)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/01/25 11:47
S7	175394	heat with sink	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/01/25 11:47
S8	2042431	seal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/01/25 11:47
S9	35	S5 S6 S7 S8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	SAME	ON	2013/01/25 11:48
S10	96769	S5 S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	SAME	ON	2013/01/25 11:49
S11	6317	S7 S8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	SAME	ON	2013/01/25 11:49
S12	96	S10 S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/01/25 11:49
S13	2808	S5 S6 S8	US-PGPUB; USPAT;	SAME	ON	2013/01/25

EAST Search History

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			11:50
S14	135	S7 S13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/01/25 11:50
S15	2	(panel and antenna and cavity and cover and heat and seal).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/01/25 11:51
S16	9442	343/700ms	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/01/25 11:52
S17	11152	343/702	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/01/25 11:52
S18	2795	343/872	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/01/25 11:52
S19	1682	343/873	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	AND	ON	2013/01/25 11:52

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Sheet	1	of	2
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Complete if Known

Application Number	12/792,367
Filing Date	2 June 2010
First Named Inventor	RODGER
Art Unit	2821
Examiner Name	To be assigned
Attorney Docket Number	7836-107560-CIP

U. S. PATENT DOCUMENTS

[illegible]

FOREIGN PATENT DOCUMENTS

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No.	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T ⁶
		Country Code ³ Number ⁴ Kind Code ⁵ (if known)	MM-DD-YYYY			
		WO 2009/011601 A1	01-22-2009	TIMES-7 HOLDINGS		

Examiner Signature	/Tho Phan/ (01/25/2013)	Date Considered	
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EX-1002

Ericsson Inc. and Verizon Wireless v. Procomm International PTE Ltd.

0047

Receipt date: 07/21/2010

12792367 - GAU: 2821

PTO/SB/08b (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)		Complete if Known	
		Application Number	12/792,367
		Filing Date	2 June 2010
		First Named Inventor	RODGER
		Art Unit	2821
		Examiner Name	To be assigned
Sheet 2 of 2	Attorney Docket Number	7836-107560-CIP	

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		Copy of International Search Report and Written Opinion regarding international application PCT/US2009/066345 undated	

Examiner Signature	/Tho Phan/ (01/25/2013)	Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.
 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.
 This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO:
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Receipt date: 07/27/2012

12792367 - GAU: 2821

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		12792367	
	Filing Date		2010-06-02	
	First Named Inventor	Derek Rodger		
	Art Unit	2821		
	Examiner Name	na		
	Attorney Docket Number	107560-CIP		

U.S.PATENTS								
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Patent citation information please click the Add button.								
U.S.PATENT APPLICATION PUBLICATIONS								
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1	20060250311		2006-11-09	Bishop, Donald M.			
	2	20050104792		2005-05-19	Asao Hideki et al.			
	3	20080252552		2008-10-16	Goebel Uhland et al.			
If you wish to add additional U.S. Published Application citation information please click the Add button.								
FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
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12792367 - GAU: 2821

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	Attorney Docket Number	107560-CIP	

If you wish to add additional Foreign Patent Document citation information please click the Add button			
NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	Supplementary European Search Report for related Application No. EP 09 83 1021 dated July 4, 2012.	☐
If you wish to add additional non-patent literature document citation information please click the Add button			
EXAMINER SIGNATURE			
Examiner Signature	/Tho Phan/ (01/25/2013)		Date Considered
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			
¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.			

Receipt date: 06/28/2012

12792367 - GAU: 2821

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		12792367
	Filing Date		2010-06-02
	First Named Inventor	Derek RODGER	
	Art Unit	2821	
	Examiner Name	na	
	Attorney Docket Number	107560-cip	

1	PCT Written Opinion for PCT/US2010/037088 dated June 14, 2012.	☐
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Examiner Signature	/Tho Phan/ (01/25/2013)	Date Considered
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Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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	Attorney Docket Number	107560-CIP	

U.S.PATENTS								
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1							
If you wish to add additional U.S. Patent citation information please click the Add button.								
U.S.PATENT APPLICATION PUBLICATIONS								
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
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	2	20050104792		2005-05-19	Asao Hideki et al.			
	3	20080252552		2008-10-16	Goebel Uhland et al.			
If you wish to add additional U.S. Published Application citation information please click the Add button.								
FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							☐

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		12792367
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If you wish to add additional Foreign Patent Document citation information please click the Add button			
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	Supplementary European Search Report for related Application No. EP 09 83 1021 dated July 4, 2012.	☐
If you wish to add additional non-patent literature document citation information please click the Add button			
EXAMINER SIGNATURE			
Examiner Signature		Date Considered	
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	12792367
	Filing Date	2010-06-02
	First Named Inventor	Derek Rodger
	Art Unit	2821
	Examiner Name	na
	Attorney Docket Number	107560-CIP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

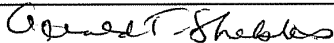
☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature		Date (YYYY-MM-DD)	2012-07-27
Name/Print	Gerald T. Shekleton	Registration Number	27,466

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Electronic Acknowledgement Receipt

EFS ID:	13357727
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Gerald T. Shekleton/mawish elahi
Filer Authorized By:	Gerald T. Shekleton
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	27-JUL-2012
Filing Date:	02-JUN-2010
Time Stamp:	13:04:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	107560cipids.PDF	63368 58353d0ec9524118f8ace5b0eeb79a73bb51803e	no	3

Warnings:

Information:

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2	Non Patent Literature	107560cipart.PDF	124040	no	6
			fb10bad538c845f351bc6aa09c7628123d6c774d		

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Total Files Size (in bytes):	187408
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	12792367
Filing Date	2010-06-02
First Named Inventor	Derek RODGER
Art Unit	2821
Examiner Name	na
Attorney Docket Number	107560-cip

1	PCT Written Opinion for PCT/US2010/037088 dated June 14, 2012.	☐
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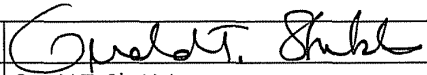
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Examiner Signature		Date Considered	
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¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

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	First Named Inventor	Derek RODGER
	Art Unit	2821
	Examiner Name	na
	Attorney Docket Number	107560-cip

CERTIFICATION STATEMENT	
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☐ See attached certification statement.	
☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.	
☐ A certification statement is not submitted herewith.	
SIGNATURE	
A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.	
Signature	
Date (YYYY-MM-DD)	2012-06-28
Name/Print	Gerald T. Shekleton
Registration Number	27,466
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ADVANCE E-MAIL

From the INTERNATIONAL BUREAU

PCT

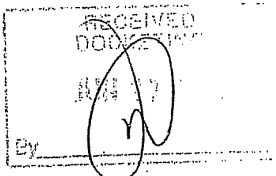
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(CHAPTER I OF THE PATENT COOPERATION
TREATY)
(PCT Rule 44bis.1(c))

To:

107560-1012
WJL C.F.
GURFINKEL, Daniel, M.
Husch Blackwell Sanders Welsh & Katz
120 S. Riverside Plaza, Suite 2200
Chicago, IL 60606
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 14 June 2012 (14.06.2012)		
Applicant's or agent's file reference 7836-107560-PCT2		IMPORTANT NOTICE
International application No. PCT/US2010/037088	International filing date (day/month/year) 02 June 2010 (02.06.2010)	Priority date (day/month/year) 02 December 2009 (02.12.2009)
Applicant ANDREW LLC et al		

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)



The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Nora Lindner
Facsimile No. +41 22 338 82 70	e-mail: pt03.pct@wipo.int

Form PCT/IB/326 (January 2004)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 7836-107560-PCT2	FOR FURTHER ACTION		See item 4 below
International application No. PCT/US2010/037088	International filing date (<i>day/month/year</i>) 02 June 2010 (02.06.2010)	Priority date (<i>day/month/year</i>) 02 December 2009 (02.12.2009)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant ANDREW LLC			

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).		
2.	This REPORT consists of a total of 4 sheets, including this cover sheet.		
In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.			
3.	This report contains indications relating to the following items:		
☒	Box No. I	Basis of the report	
☐	Box No. II	Priority	
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	
☐	Box No. IV	Lack of unity of invention	
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	
☐	Box No. VI	Certain documents cited	
☐	Box No. VII	Certain defects in the international application	
☐	Box No. VIII	Certain observations on the international application	
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Date of issuance of this report 05 June 2012 (05.06.2012)
	Authorized officer Nora Lindner e-mail: pt03.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

DANIEL M. GURFINKEL

HUSCH BLACKWELL SANDERS WELSH & KATZ 120 S.
RIVERSIDE PLAZA, SUITE 2200 CHICAGO IL 60606 USA

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) 29 DECEMBER 2010 (29.12.2010)

Applicant's or agent's file reference
7836-107560-PCT2

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2010/037088

International filing date (day/month/year)

02 JUNE 2010 (02.06.2010)

Priority date (day/month/year)

02 DECEMBER 2009 (02.12.2009)

International Patent Classification (IPC) or both national classification and IPC

H01Q 21/08(2006.01)i, H01Q 1/42(2006.01)i

Applicant

ANDREW LLC et al

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
Government Complex-Daejeon, 139
Seonsa-ro, Seo-gu, Daejeon 302
-701, Republic of Korea
Facsimile No. 82-42-472-7140

Date of completion of this opinion

28 DECEMBER 2010 (28.12.2010)

Authorized officer

Kim Jeong Seok

Telephone No.82-42-481-8481

Form PCT/ISA/237 (cover sheet) (July 2009)



WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2010/037088

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of :

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of:

a. a sequence listing filed or furnished

☐ on paper

☐ in electronic form

b. time of filing or furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in electronic form.

☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2010/037088

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-8	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-8	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims	NONE	NO

2. Citations and explanations :

1. Prior Art

Reference is made in the present opinion to the following document cited in the search report. The numbering is also retained in the further procedure:

D1: WO 2006-119454 A1 (MEDIACELL LICENSING CORP et al.) 09 November 2006

D2 : US 2005-0104792 A1 (ASAO, HIDEKI et al.) 19 May 2005

D1 discloses an antenna system comprising: an enclosure consists of a door, housing, electrical equipment and a first ground plane; a second ground plane; antennas; and a radome.

D2 discloses high frequency package comprising: a plurality of apertures as antennas; a metal frame; a microwave circuitry; and a metal bottom plate.

2. Novelty and Inventive Step (PCT Articles 33(2) and 33(3))

The subject matter of claim 1 of the present invention relates to a panel antenna comprising: a cavity enclosure including a rear panel, a first side wall, a second side wall, a top wall and a bottom wall; an internal cover; a micro radio mounted to an internal surface of the first side wall; a first heat sink; and a radome mounting to the internal cover and enclosing the RF radiating module.

Document D1 is regarded as the closest prior art to the subject matter of claim 1. The structure of the cavity enclosure, the internal cover, the micro radio, the radome, and the RF radiating module of claim 1 correspond respectively to the enclosure, the second ground plane, the electrical equipment, the radome, and the antennas of D1. D1 does not disclose the heat sink. Therefore, the subject matter of claim 1 is considered to be novel under PCT Article 33(2). The addition of the heat sink to the panel antenna comes within the scope of the customary practice followed by a person skilled in the art. Therefore, the subject matter of claim 1 cannot be considered as involving an inventive step under PCT Article 33(3).

Claims 2-8 are dependent on claim 1 of the present application. The additional features of claims 2-8 can be anticipated by document D1 or come within the scope of the customary practice followed by a person skilled in the art. Therefore, the subject matter of claims 2-8 is considered to be novel but cannot be considered as involving an inventive step under PCT Article 33(2) and 33(3).

3. Industrial Applicability (PCT Article 33(4))

Claims 1-8 of the present application meet the criteria set out in PCT Article 33(4), because the subject matter of claims 1-8 is considered to be industrially applicable.

Electronic Acknowledgement Receipt	
EFS ID:	13129592
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Gerald T. Shekleton/mawish elahi
Filer Authorized By:	Gerald T. Shekleton
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	28-JUN-2012
Filing Date:	02-JUN-2010
Time Stamp:	13:31:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	ids.PDF	40191 b85e03c68fa2a996511e8d9cca1033dc5b5c04d5	no	2
Warnings:					
Information:					

This is not an USPTO supplied IDS fillable form

2	Non Patent Literature	pct.PDF	110999	no	5
			6c1f84988f950951418f148b532b0ff0d068a3bbc		

Warnings:

Information:

Total Files Size (in bytes):	151190
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

10/24/2001 W&K Substitute for Form PTO-SB/08A, which is a US PTO Substitute for form 1449A/PTO and 1449B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)		Complete if Known			
		Application Number	12/792,367		
		Filing Date	June 2, 2010		
		First Named Inventor	Derek RODGER		
		Art Unit	2821		
		Examiner Name	n/a		
Sheet	1	of	1	Attorney Docket Number	107560-CIP

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. 1	Document Number Number - Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US 2007-0001919 A1	01/04/2007	Niallo Carroll et al	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Foreign Patent Document Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		WO 2009-011601 A1	01/22/2009	Times-7 Holding Limited et al.		

OTHER ART - NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ⁶
		Written Opinion for related case PCT/US2009/066345.	

Examiner Signature	Date Considered
-----------------------	--------------------

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹Applicant's unique citation designation number (optional). ²See Kind Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Application of: Derek RODGER :
Serial No.: 12/792,367 : Group Art Unit: 2821
Filed : June 2, 2011 : Examiner: n/a
For: PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

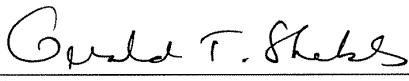
INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Applicant states that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

Respectfully submitted,

By 
Gerald T. Shekleton, Reg. No. 27,466

June 29, 2011
Husch Blackwell LLP
22nd Floor
120 South Riverside Plaza
Chicago, Illinois 60606
312/655-1500

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 January 2009 (22.01.2009)

PCT

(10) International Publication Number
WO 2009/011601 A1

(51) International Patent Classification:
H01Q 1/38 (2006.01) *H01Q 5/00* (2006.01)

(74) Agents: ELLIS, Verboeket, Terry et al.; PO Box 10 932,
The Terrace, Wllington 6143 (NZ).

(21) International Application Number:
PCT/NZ2008/000171

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(22) International Filing Date: 17 July 2008 (17.07.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
556602 18 July 2007 (18.07.2007) NZ
566529 7 March 2008 (07.03.2008) NZ

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*): TIMES-7 HOLDINGS LIMITED [NZ/NZ]; Luscombe Legal, Vero Bldg, 70 Tennyson, St Napier (NZ).

(72) Inventor; and

(75) Inventor/Applicant (*for US only*): EHLEN, Mathias Martin Ernest [NL/NZ]; 26 Forest Road, Upper Hutt (NZ).

Published:

— with international search report

(54) Title: A PANEL ANTENNA AND METHOD OF FORMING A PANEL ANTENNA

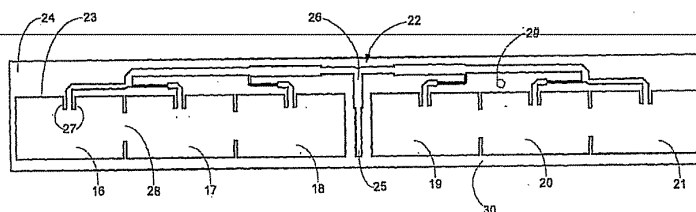


Figure 5

(57) Abstract: A method of forming an antenna by providing a first panel including a first conductive sheet secured to a sheet of dielectric material and forming one or more radiating elements and/or a feed network in the conductive sheet by forming grooves in the conductive sheet. The first panel may be a construction grade building panel or a similar suitable panel. The method enables panel antennas to be manufactured using inexpensive materials using inexpensive manufacturing processes.

WO 2009/011601 A1

ADVANCE E-MAIL

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
TRANSMITTAL OF COPY OF INTERNATIONAL
PRELIMINARY REPORT ON PATENTABILITY
(CHAPTER I OF THE PATENT COOPERATION
TREATY)
(PCT Rule 44bis.1(c))

To:

GURFINKEL, Daniel, M.
HUSCH BLACKWELL SANDERS WELSH & KATZ
120 South Riverside Plaza
Suite 2200
Chicago, IL 60606
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 16 June 2011 (16.06.2011)		IMPORTANT NOTICE	
Applicant's or agent's file reference 7836-107560-PCT			
International application No. PCT/US2009/066345	International filing date (day/month/year) 02 December 2009 (02.12.2009)	Priority date (day/month/year) 02 December 2008 (02.12.2008)	
Applicant ANDREW LLC et al			
The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)			
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland		Authorized officer Athina Nickitas-Etienne	
Facsimile No. +41 22 338 82 70		e-mail: pt04.pct@wipo.int	

Form PCT/IB/326 (January 2004)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 7836-107560-PCT	FOR FURTHER ACTION	See item 4 below
International application No. PCT/US2009/066345	International filing date (<i>day/month/year</i>) 02 December 2009 (02.12.2009)	Priority date (<i>day/month/year</i>) 02 December 2008 (02.12.2008)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant ANDREW LLC		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 <i>bis</i> .1(a).	
2.	This REPORT consists of a total of 4 sheets, including this cover sheet. In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.	
3.	This report contains indications relating to the following items:	
	☒	Box No. I Basis of the report
	☐	Box No. II Priority
	☐	Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
	☐	Box No. IV Lack of unity of invention
	☒	Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
	☐	Box No. VI Certain documents cited
	☐	Box No. VII Certain defects in the international application
	☐	Box No. VIII Certain observations on the international application
4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70 Form PCT/IB/373 (January 2004)	Date of issuance of this report 07 June 2011 (07.06.2011) Authorized officer Athina Nickitas-Etienne e-mail: pt04.pct@wipo.int
--	--

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

DANIEL M. GURFINKEL

HUSCH BLACKWELL SANDERS WELSH & KATZ 120
SOUTH RIVERSIDE PLAZA SUITE 2200 CHICAGO IL
60606 USA

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) 25 JUNE 2010 (25.06.2010)

Applicant's or agent's file reference
7836-107560-PCT

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2009/066345

International filing date (day/month/year)

02 DECEMBER 2009 (02.12.2009)

Priority date(day/month/year)

02 DECEMBER 2008 (02.12.2008)

International Patent Classification (IPC) or both national classification and IPC

H01Q 21/12(2006.01)i, H01Q 21/06(2006.01)i, H01Q 19/10(2006.01)i, H04M 1/00(2006.01)i, G01S 13/00(2006.01)i

Applicant

ANDREW LLC et al

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR



Korean Intellectual Property Office
Government Complex-Daejeon, 139
Seonsa-ro, Seo-gu, Daejeon 302
-701 Republic of Korea
Facsimile No. 82-42-472-7140

Date of completion of this opinion

25 JUNE 2010 (25.06.2010)

Authorized officer

LEE, Saang Woong

Telephone No. 82-42-481-8210



Form PCT/ISA/237 (cover sheet) (July 2009)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2009/066345

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. a sequence listing filed or furnished
 - ☐ on paper
 - ☐ in electronic form
 - b. time of filing or furnishing
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
5. ☐ In addition, in the case that more than one version or copy of a sequence listing as been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2009/066345

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-18	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	1-18	YES
	Claims	NONE	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims	NONE	NO

2. Citations and explanations :

A. Reference is made to the following documents:

Reference is made to the following documents identified in the International Search Report(ISR):

D1: US 2007-0001919 A1 (NIALLO CARROLL et al.) 04 January 2007

D2: WO 2009-011601 A1 (TIMES-7 HOLDINGS LIMITED et al.) 22 January 2009

B. Reasoned statement with regard to novelty and inventive step:

1. Novelty and Inventive step regarding claims 1-18:

D1, which is considered to represent the most relevant state of the art, discloses an antenna assembly for a cellular telecommunications system having an array of radiating elements, patches, situated in front of a panel having an electrically conductive face, from which the subject matter of claims 1, 12, 16 differs in that a panel antenna comprising an enclosure including a rectangular rear panel and first, second, third walls extended from longitudinal edges and those walls, an inner seal, a plurality of micro radios, a radome, and these are not disclosed in D1, accordingly, are also considered to be not obvious to a person skilled in the art by D1 or D2, taken alone or in combination.

Claims 2-11 are dependent on claim 1, claims 13-15 on claim 12, claims 17-18 on claim 16, therefore the claims meet the requirements of novelty and inventive step.

Therefore, the subject matter of claims 1-18 is being considered to be novel and to involve an inventive step under PCT Article 33(2) and (3).

C. Reasoned statement with regard to industrial applicability

Claims 1-18 meet the criteria set out in PCT Article 33(4), because all the claims are considered to be industrially applicable.

Electronic Acknowledgement Receipt	
EFS ID:	10424233
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Gerald T. Shekleton/mawish elahi
Filer Authorized By:	Gerald T. Shekleton
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	30-JUN-2011
Filing Date:	02-JUN-2010
Time Stamp:	11:54:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	107560ids1449.PDF	40739 89cfe9b7e540029beb840614094bd7aface5da3c	no	1
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Information:					

This is not an USPTO supplied IDS fillable form					
2	Transmittal Letter	107560idsltr.PDF	11120 ef3ebec14e505fd8a436270db4d64df69cca90e8	no	1
Warnings:					
Information:					
3	Foreign Reference	107560idswo.PDF	36100 abb3ec6499bad999f85aea83a5016cf948ad2000	no	1
Warnings:					
Information:					
4	Non Patent Literature	107560idsopinion.PDF	119350 efa2c0af0f0262ad0c2a183e074fe2b50d185987	no	5
Warnings:					
Information:					
Total Files Size (in bytes):				207309	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/792,367	06/02/2010	Derek RODGER	7836-107560-CIP

CONFIRMATION NO. 4588

PUBLICATION NOTICE

24628

Husch Blackwell Sanders, LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606



Title:PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

Publication No.US-2011-0032158-A1

Publication Date:02/10/2011

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Sheet 2 of 2	Application Number	12/792,367
	Filing Date	2 June 2010
	First Named Inventor	RODGER
	Art Unit	2821
	Examiner Name	To be assigned
	Attorney Docket Number	7836-107560-CIP

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
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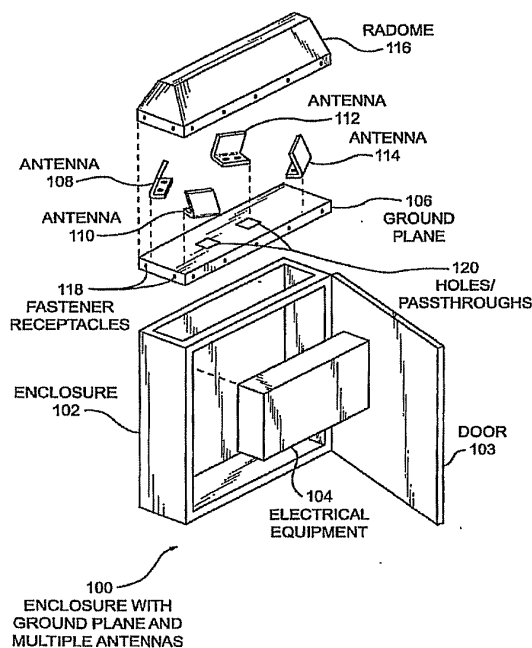
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(75) Inventor/Applicant (*for US only*): **BISHOP, Donald, M.**

[Continued on next page]

(54) Title: ENCLOSURE WITH GROUND PLANE



(57) Abstract: A system and method for mounting one or more radio antennas in an outdoor enclosure by placing a ground plane underneath the antennas and above any electrical devices. The ground plane may be used to mount the antennas in any configuration and be coupled to earth ground. In some embodiments, an outdoor enclosure may have a weatherproof radome mounted around the antennas.

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Enclosure with Ground Plane

Cross Reference to Related Applications

5 This application claims priority to and the benefit of United States provisional patent application serial number 60/677,644 entitled "Enclosure With Ground Plane" filed May 4, 2005 by Donald M. Bishop, which is hereby expressly incorporated by reference.

Background of the Invention

a. Field of the Invention

10 The present invention pertains generally to electronics equipment enclosures and specifically to those enclosures housing a radio antenna.

b. Description of the Background

Communications equipment is deployed in many locations to satisfy society's seemingly insatiable thirst for communications bandwidth. No longer does a single
15 phone line into a residence supply the connectedness, but cable television, high speed internet, and other communications media are standard in today's home or business.

Many devices are required to be deployed at or near a subscriber's location, sometimes housed in outdoor equipment boxes. These boxes are located adjacent to a residence or business and may house such equipment as fiber optic converters and
20 amplifiers, coaxial cable devices, power supplies, switch boxes, and other devices. In many cases, the devices may radiate some radio frequency energy.

As wireless communication technology becomes more pervasive, adding wireless radios to the existing enclosures causes several problems, not the least of which are the potential electrical interferences between the radio and antenna system
25 with other devices mounted in the enclosure.

It would therefore be advantageous to provide a system and method for constructing an equipment enclosure that enables high fidelity radio transmission while housing several other electrical devices, including devices that radiate
30 potentially interfering RF energy.

Summary of the Invention

The present invention provides a system and method for mounting one or more radio antennas in an outdoor enclosure by placing a ground plane underneath the antennas and above any electrical devices. The ground plane may be used to mount

the antennas in any configuration and be coupled to earth ground. In some embodiments, an outdoor enclosure may have a weatherproof radome mounted around the antennas.

5 An embodiment may include an enclosure comprising: a lower equipment housing comprising at least one mounting device for an electrical device; a ground reference mounted substantially horizontally above the lower equipment housing and electrically connected with earth ground, the ground reference defining a substantially horizontal plane on the upper surface of the ground reference; and at least one antenna mounted above the ground plane; wherein the ground reference comprises a
10 substantially flat portion beneath the at least one antenna, the flat portion having a plan area substantially larger than a plan area of the antenna, the ground reference being mounted such that all non-antenna conductive devices above the plane are connected to earth ground.

Another embodiment may include a network interface comprising: a lower
15 equipment housing comprising at least one mounting device for an electrical device, the electrical device comprising an interface to a network; a ground reference mounted substantially horizontally above the lower equipment housing and electrically connected with earth ground, the ground reference defining a substantially horizontal plane on the upper surface of the ground reference; and at least one antenna
20 mounted above the ground plane, the antenna adapted to send and receive communications to a network subscriber; wherein the ground reference comprises a substantially flat portion beneath the at least one antenna, the flat portion having a plan area substantially larger than a plan area of the antenna, the ground reference being mounted such that all non-antenna conductive devices above the plane are
25 connected to earth ground.

Brief Description of the Drawings

In the drawings,
30 FIGURE 1 is an exploded perspective view of an embodiment showing an enclosure with four antennas.
FIGURE 2 is an assembled perspective view of the embodiment of FIGURE
1.

FIGURE 4 is a partially exploded perspective view of an embodiment with a single antenna.

FIGURE 6 is a plan view of a residential neighborhood being served by an enclosure having four antennae.

Specific embodiments of the invention are described in detail below. The embodiments were selected to illustrate various features of the invention, but should not be considered to limit the invention to the embodiments described, as the invention is susceptible to various modifications and alternative forms. The invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the claims. In general, the embodiments were selected to highlight specific inventive aspects or features of the invention.

20 When elements are referred to as being “connected” or “coupled,” the elements can be directly connected or coupled together or one or more intervening elements may also be present. In contrast, when elements are referred to as being “directly connected” or “directly coupled,” there are no intervening elements present.

Figures 1 and 2 illustrate an embodiment 100 showing an enclosure with a ground plane and multiple antennas. Figure 1 is an exploded view while Figure 2 is an assembled view of the same embodiment.

An enclosure 102 has a door 103 that houses some electrical equipment 104. Mounted to the top of the enclosure 102 is a ground plane 106 to which antennas 108, 110, 112, and 114 are attached. A radome 116 covers the antennae. The ground plane 106 may have fastener receptacles 118 as well as holes or passthroughs 120.

5 The electrical equipment 104 may have several connections to antennae 122 as well as connections 124 through the floor of the enclosure.

The enclosure 102 may be made from either conductive or nonconductive material. For example, an embodiment for outdoor use may have an enclosure 102 fabricated from injection molded plastic, with or without filler or strengthening

10 additives. In many cases, a molded enclosure 102 may not be fully conductive. Such enclosures are known in the art and are manufactured in many shapes and sizes.

The enclosure 102 may be manufactured from conductive material, such as metal or plastic material that has conductive filler or conductive coating applied. In some embodiments, a conductive mesh may be incorporated into one or more faces of

15 the enclosure.

The door 103 may be of any type of access to the electrical equipment 104. The door 103 may be hinged or may be a removable access panel. In some embodiments, an enclosure may not have a door and may afford access to the electrical equipment 104 by some other means.

20 In embodiments where the enclosure 102 is made from a conductive material, the door 103 may also be manufactured from a conductive material. In such cases, a resilient electrically conductive interface such as a conductive gasket may be used around the periphery of the door 103 to make electrical contact between the enclosure 102 and the door 103.

25 The electrical equipment 104 may be any type of electrical equipment whatsoever. In some cases, a transformer, power supply, or various radio frequency (RF) devices may be present either separately or as part of a single device. Many devices, such as transformers, power supplies, RF devices, and other devices generate RF interference that may degrade the performance of nearby radios. This problem is

30 exacerbated when the enclosure is also used for radio communications.

In a typical enclosure used for wireless communications, a network signal may be transmitted through a cable or fiber optic connection into the enclosure. Power supplies, converters, modems, and various electrical devices may process incoming

signals and connect to one or more radio transceivers. The transceiver may connect to one or more antennas located above the ground plane 106.

In another enclosure used for wireless communications, power may be supplied from a hard wired direct connection through the bottom of the enclosure 102 to supply power to one or more radio transceivers in the enclosure 102. Such an embodiment may be useful in a system where the transceivers serve to relay communications from one antenna to another. The antennas may be directional antennas and arranged to receive transmissions from one area and transmit the signals to another area. In another embodiment, one antenna and transceiver may send and receive communications in a first frequency band using a first protocol which transfers the communications to a second antenna and transceiver in a second frequency band using a second protocol.

The ground plane 106 may be a substantially flat and generally horizontal conductive material. The ground plane 106 may shield the various antennae from interference from the electrical equipment 104. In some embodiments, the ground plane 106 may be manufactured from metal, including various steels, aluminum, brass, or other conductive metal. The ground plane 106 may be treated with a metallic or other conductive coating that may additionally provide corrosion protection.

In some embodiments, the ground plane 106 may be a nonconductive material that has a conductive treatment or coating. For example, injection molded plastic may be nonconductive but may be treated with a metallic conductive coating by spray application, plating, or any other mechanism.

In many embodiments, the substantially flat and substantially horizontal conductive upper surface of the ground plane 106 may provide shielding from the electrical equipment 104 as well as a ground plane for the various antennae.

The ground plane 106 may be connected to earth ground through direct connection to a grounded rod in the earth or through connection to a conductive mechanical frame within the enclosure 102. Other connections may also be used to connect the ground plane 106 to earth ground. In general, non-antenna but metallic items above the ground plane may be grounded.

The ground plane 106 may have several holes or passthroughs 120. Electrical connections between a radio transmitter within the enclosure 104 and the antennae may be made by passing a cable through the holes 120 or by installing a panel

mounted connector or other electrical passthrough on the ground plane 106. In cases where the frequency of the radio signals is known, the size of the holes 120 may be selected to minimize transference of radio energy from the enclosure 102.

5 The ground plane 106 may prevent unwanted interference between noise or other energy generated within the enclosure 102 from interfering with or otherwise degrading the performance of signals transmitted or received on the antennae. The ground plane 106 may not necessarily have to cover the top portion of the enclosure 102, but may extend past the antenna's horizontal plan area sufficiently to reduce interference.

10 In many cases, housing the various electrical equipment 104 in a tightly shielded enclosure is cost prohibitive. The use of nonmetallic enclosures is both easy to install as well as maintain. Additionally, nonmetallic enclosures may have certain molded-in features that reduce assembly and installation costs. With such enclosures, the energy radiation from inside the enclosure 102 may pose considerable difficulty
15 for effectively performing radio transmissions. With this in mind, the ground plane 106 may reduce the unwanted interference of radio transmissions.

In some configurations, the ground plane 106 may incorporate mounting hardware or features that may aid installation of antennae. For example, a ground plane may have a fastener, hole, raised area, cutout area, mechanical interlocking
20 feature, or other feature by which one or more antennae may be located and attached to the ground plane 106. The ground plane 106 may include mounting features including any type of bracketry on which an antenna may be mounted.

The antennae may be any type of radio frequency antenna. The antennae 108, 110, 112, and 114 may be panel type antennae that are configured to transmit in four
25 separate quadrants. Any other type of antenna may be used, including dipole, rod, diversity, sectorized, parabolic, or any antenna imaginable. In some situations, multiple antennae may be designed to work independently of each other while in other situations, two or more antennae may be designed to work cooperatively, such as in a diversity antenna situation.

30 The antennae may have conductive connections between the antennae and the ground plane 106. In some cases, a portion of the antenna may be electrically connected to the ground plane 106, while in other cases, the antenna may electrically float with respect to the ground plane.

The radome 116 may be a nonconductive cover that protects the antennae. In many cases, the radome 116 may be manufactured from a molded or fabricated plastic that has known frequency transmission characteristics. When the frequency transmission characteristics are known, certain adjustments to the antennae and radio transceivers may be made, including power level and frequency response characteristics. In such cases, the antennae and radome combination may be specified together with the ground plane and have predictable and repeatable known performance characteristics.

The radome 116 may be attached directly to the ground plane 106 through the use of fastener holes 118 or by any other mechanical attachment. In some cases, the radome may be sealed in a weather-tight manner with gasketing to prevent water or dust infiltration. In other cases, the radome 116 may not be sealed to the enclosure 102.

In many cases, the radome 116 may prevent unwanted movement, tampering, or disruption of the antennae. In addition, the radome 116 may provide an aesthetically pleasing cover for the enclosure 102.

Figure 3 is a cross-sectional illustration of an embodiment 300 showing an enclosure with antennas and a radome. The enclosure 302 contains electrical equipment 304. Attached to the top of the enclosure 302 is a ground plane 306, to which is attached antennas 308 and 310. The radome 312 covers the antennae.

The radome 312 may be fashioned out of sheet material, such as sheet metal. The radome 312 may be formed into a section as shown that comprises a lip 314. The radome 312 may be attached to the enclosure 302 by fastening through lip 314 and lip 316. In some cases, a gasket or sealant may be used between lips 314 and 316.

The cables 314 may connect the electrical equipment 304 to the antennae. The cables 314 may pass through an opening formed by the lip 316 and a hole in the ground plane 306. In some embodiments, the cables 314 may be connected through passthroughs such as panel mounted connectors or other grounded or isolated electrical connections that may minimize RF radiation through the ground plane 306.

The radome 312 may be fastened to the ground plane 306 or may be attached by any other mechanism. In some cases, the radome 312 may be extended to engage a portion of the enclosure 302 and not contact the ground plane 306.

Figure 4 illustrates an embodiment 400 showing a single antenna mounted on an enclosure. The enclosure 402 has an antenna 404 mounted on a ground plane 406.

A radome 408 is shown exploded from the assembly. Cable 410 comes through the enclosure 402 through the passthrough 412.

The embodiment 400 illustrates an embodiment wherein the ground plane 406 only partially covers the top of the enclosure 402. The ground plane 406 may be 50%
5 or more of the plan area of the antenna 404. The plan area is the projection of the antenna 404 onto the substantially horizontal surface of the ground plane 406.

Radome 408 may be attached to the enclosure 402 by any mechanical means whatsoever and need not extend to the outer boundaries of the enclosure 402.

Figure 5 illustrates an embodiment 500 showing an enclosure with rod
10 antennas. The enclosure 502 houses electrical equipment 504. On the top of the enclosure 502 is mounted a ground plane 506 which holds antennae 508 and 510. A radome 512 protects the antenna 508 and 510.

Embodiment 500 illustrates that any type of antenna may be used in the present invention, including rod, dipole, parabolic, planar, or any type of antenna
15 whatsoever.

Figure 6 illustrates a plan view of an embodiment 600 showing wireless access points deployed in a residential area. A road 602 is shown with houses 604, 606, 608, 610, 612, and 614. Enclosure 601 is mounted at a central point of the community and contains four different antennae. One antenna has coverage area 616 that
20 encompasses house 608 and 610. A second antenna has coverage area 618 that encompasses house 606. A third antenna has coverage area 620 that encompasses houses 604 and 612. A fourth antenna has coverage area 622 that encompasses house 614. The enclosure 601 is connected to the network 624 through a network branch 626 and junction 628.

Embodiment 600 is an application for wireless connectivity in a residential
25 area. The enclosure 601 may provide various communications to and from the homes, such as internet data connections, voice telephony, video services, and any other communication. In many applications, the wireless access points within the enclosure 601 may use a standardized radio communications protocol, such as those
30 defined by IEEE 802.11 specification. In other applications, different radio communications protocols, including custom or non-standard protocols, may be used. The enclosure 601 may be mounted on the ground with underground connections to the network branch 626 and power.

The enclosure 601 may contain one or more radios, each capable of one or more communication sessions. In the embodiment 600, directional antennas may be used to subdivide the total coverage area into several smaller sectors or coverage areas 616, 618, 620, and 622. Each coverage area may be covered by a separate
5 radio.

The network 624 may be a coaxial cable, fiber optic, twisted pair, or other communications cable. In some configurations, the network 624 may be similar to a conventional cable television plant using DOCSIS or other communication protocols connected to a cable modem termination system ('CMTS'). In other configurations,
10 the network 624 may be twisted pair digital subscriber line ('DSL') lines that are connected using a digital subscriber line area manager ('DSLAM'). Such networks may be classified as examples of linear broadband networks. In still other configurations, the network may be an Ethernet or Ethernet-type network.

In other embodiments, the network 624 may be a wireless network on the
15 same or different frequency band and protocols as the communications with the various coverage areas. For example, a microwave or other long range radio transmission may connect the enclosure 601 with the network 624. In some situations, a microwave or other wireless connection may serve the function as a hard wired network branch 626.

The foregoing description of the invention has been presented for purposes of
20 illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and other modifications and variations may be possible in light of the above teachings. The embodiment was chosen and described in order to best explain the principles of the invention and its practical application to
25 thereby enable others skilled in the art to best utilize the invention in various embodiments and various modifications as are suited to the particular use contemplated. It is intended that the appended claims be construed to include other alternative embodiments of the invention except insofar as limited by the prior art.

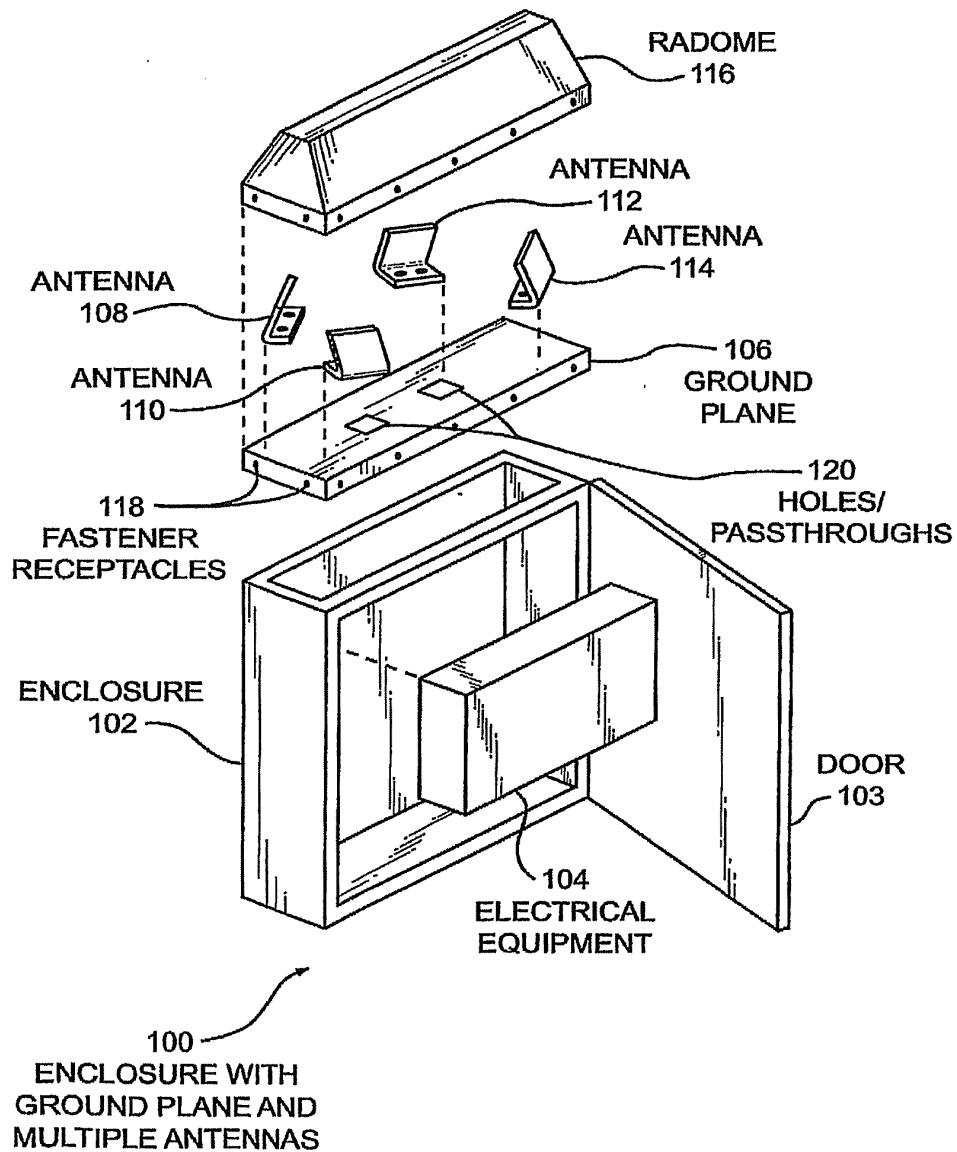
CLAIMS

What is claimed is:

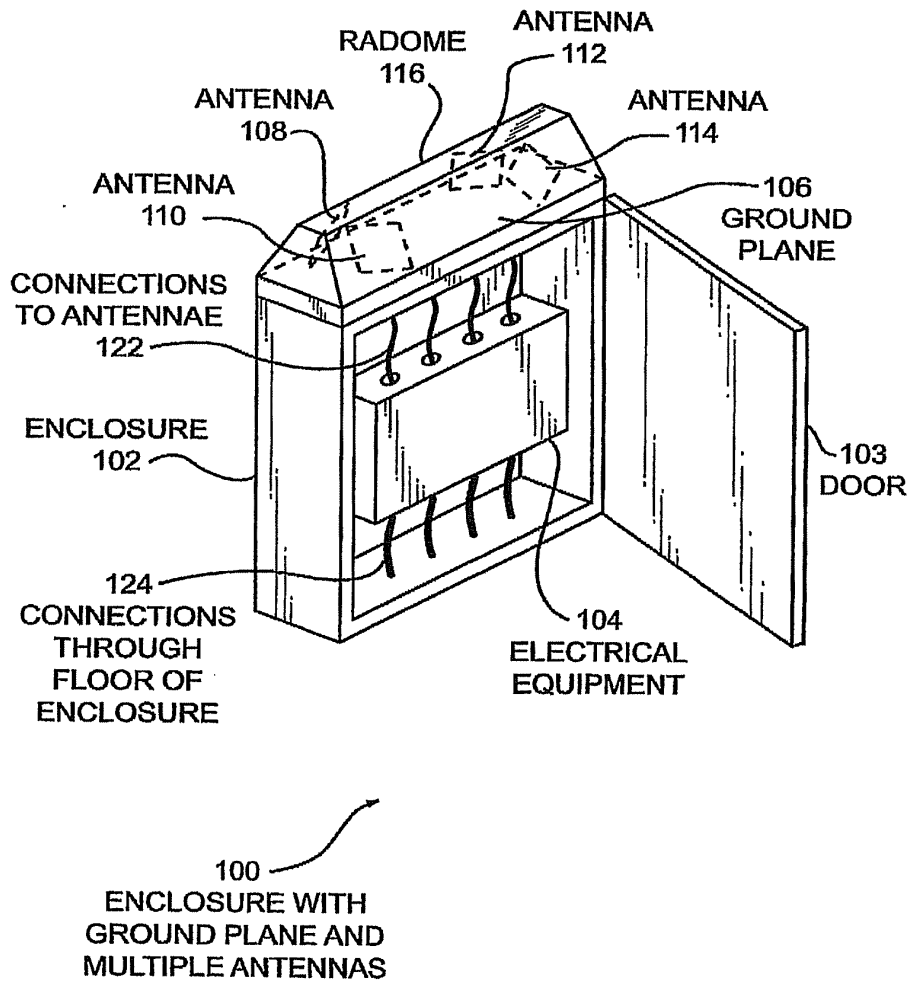
1. An enclosure comprising:
 - a lower equipment housing comprising at least one mounting device
5 for an electrical device; - a ground reference mounted substantially horizontally above said lower equipment housing and electrically connected with earth ground, said ground reference defining a substantially horizontal plane on the upper surface of said ground reference; and
10 at least one antenna mounted above said ground reference; - wherein said ground reference comprises a substantially flat portion beneath said at least one antenna, said flat portion having a plan area substantially larger than a plan area of said antenna, said ground reference being mounted such that all non-antenna conductive devices above said
15 plane are connected to earth ground.
2. The enclosure of claim 1 wherein said lower equipment housing comprises a base through which one or more electrical conductors may be passed.
3. The enclosure of claim 2 wherein said enclosure is mounted at least partially above ground.
- 20 4. The enclosure of claim 3 wherein said electrical device comprises an amplifier.
5. The enclosure of claim 3 wherein said electrical device comprises a transformer.
6. The enclosure of claim 3 wherein said electrical device comprises a power
25 supply.
7. The enclosure of claim 3 wherein said electrical connectors comprises a coaxial cable television conductor.
8. The enclosure of claim 3 wherein said electrical connectors comprises a fiber optic cable television conductor.
- 30 9. The enclosure of claim 3 wherein said electrical connectors comprises at least one twisted pair conductor.
10. The enclosure of claim 3 wherein said antenna is connected to a transceiver adapted to establish two way communication with a second radio located outside said enclosure.

11. The enclosure of claim 10 wherein said antenna is connected to a transceiver adapted to send and receive communication signals along at least one of said electrical conductors.
- 5 12. The enclosure of claim 11 wherein said at least one of said electrical conductors comprises a fiber optic linear broadband network.
13. The enclosure of claim 11 wherein said at least one of said electrical conductors comprises a coaxial linear broadband network.
14. The enclosure of claim 11 wherein said at least one of said electrical conductors comprises a twisted pair linear broadband network.
- 10 15. The enclosure of claim 1 wherein said plan area of said flat portion is at least 50% larger than said plan area of said antenna.
16. The enclosure of claim 1 further comprising:
a hinged door mounted below said ground reference.
- 15 17. The enclosure of claim 16 wherein said hinged door is mounted with a hinge axis substantially perpendicular to said plane.
18. The enclosure of claim 1 wherein said ground reference comprises at least one hole.
19. A network interface comprising:
a lower equipment housing comprising at least one mounting device
20 for an electrical device, said electrical device comprising an interface to a network;
a ground reference mounted substantially horizontally above said lower equipment housing and electrically connected with earth ground, said ground reference defining a substantially horizontal plane on the
25 upper surface of said ground reference; and
at least one antenna mounted above said ground reference said antenna adapted to send and receive communications to a network subscriber;
wherein said ground reference comprises a substantially flat portion
30 beneath said at least one antenna, said flat portion having a plan area substantially larger than a plan area of said antenna, said ground reference being mounted such that all non-antenna conductive devices above said plane are connected to earth ground.

20. The network interface of claim 19 wherein said electrical device comprises an amplifier.
21. The network interface of claim 19 wherein said electrical device comprises a transformer.
- 5 22. The network interface of claim 19 wherein said electrical device comprises a power supply.
23. The network interface of claim 19 wherein said interface to said network comprises a coaxial linear broadband network.
24. The network interface of claim 19 wherein said interface to said network
10 comprises a fiber optic linear broadband network.
25. The network interface of claim 19 wherein said interface to said network comprises at least one twisted pair linear broadband network.
26. The network interface of claim 1 wherein said plan area of said flat
15 portion is at least 50% larger than said plan area of said antenna.

**FIG. 1**

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**FIG. 2**

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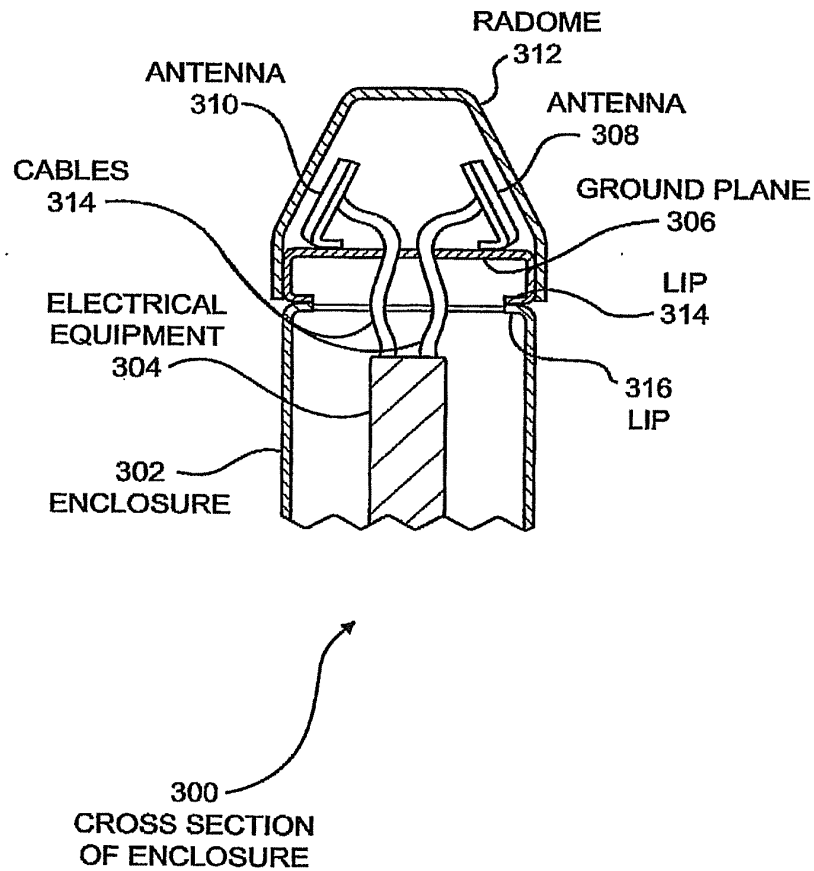
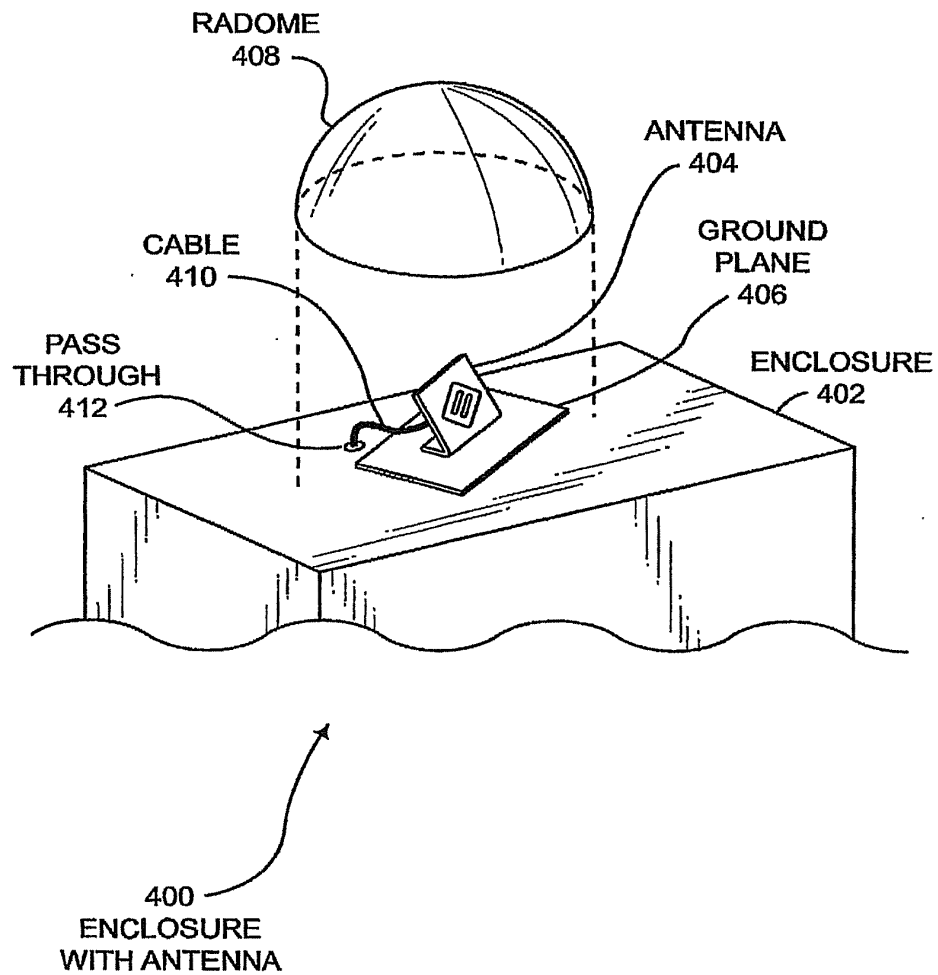
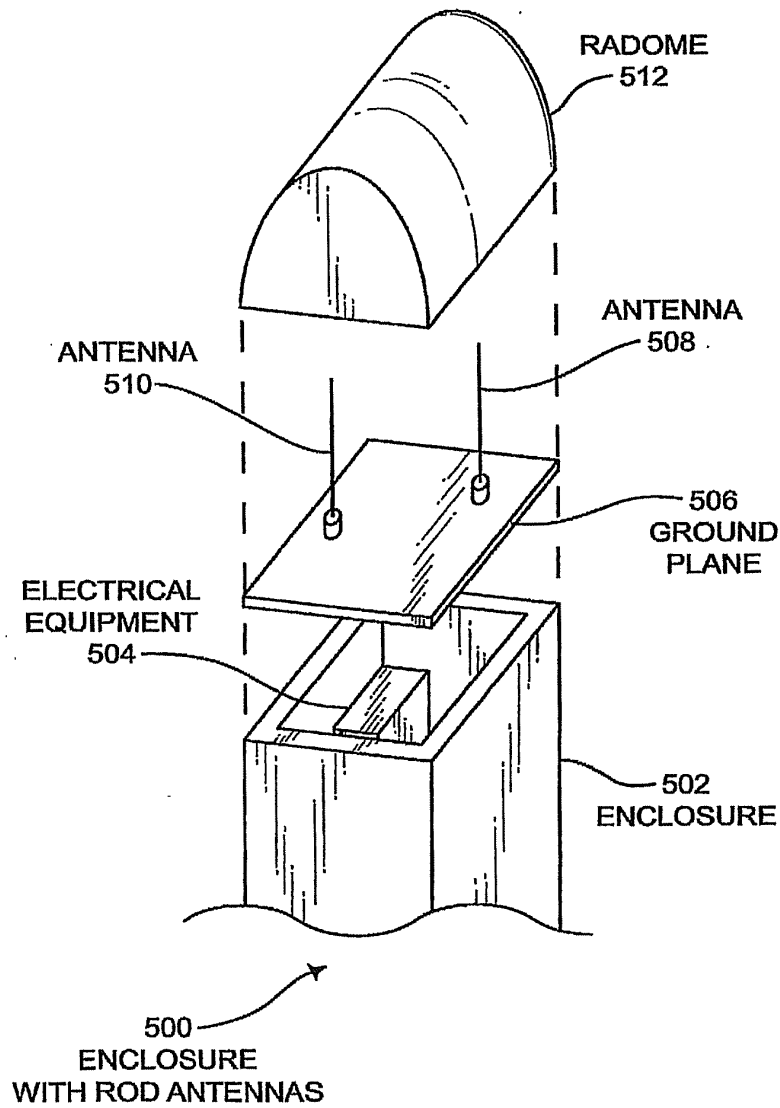


FIG. 3

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**FIG. 4**

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**FIG. 5**

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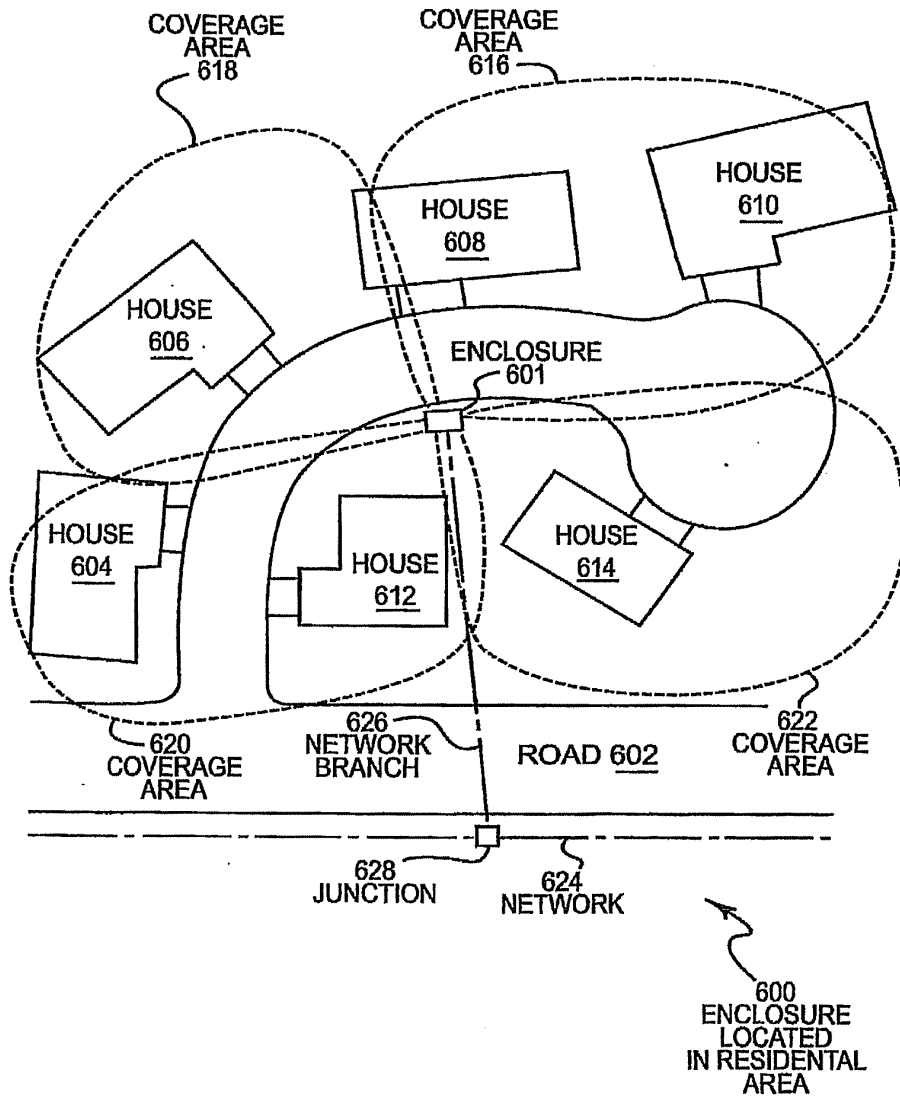


FIG. 6

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2006/017224**A. CLASSIFICATION OF SUBJECT MATTER****H05K 5/02(2006.01)i, H01Q 1/42(2006.01)i, H01Q 21/00(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC8 H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR, JP : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, KIPASS(Searching system of Korean Intellectual Property Office)

Keywords :radome, ground, antenna, enclosure, equipment

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6, 344, 833 B1 (Lin et al.) 5 February 2002 See the whole document	1 - 26
A	US 5,952,972 A (Ittipiboon et al.) 14 September 1999 See the whole document	1 - 26
A	JP 09232850 A (MATSUSHITA ELECTRIC IND CO LTD) 5 September 1997 See the whole document	1 - 26
A	KR 1020010025591 A(KOREA INFOCOM CO., LTD.) 6 April 2001 See the whole document	1 - 26

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

27 SEPTEMBER 2006 (27.09.2006)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT
Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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KR1020010025591	06.04.2001	(Family None)	

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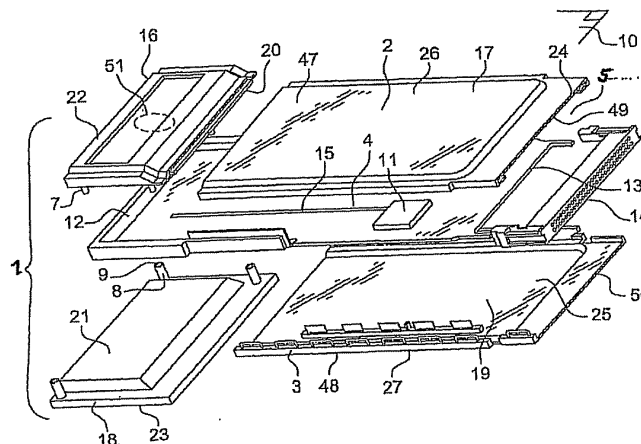
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(54) Title: PCMCIA ELECTRONIC HOUSING EQUIPPED WITH AN ANTENNA AND PROCESS FOR MANUFACTURING
THEREOF



(57) Abstract: The invention relates to a PCMCIA electronic housing (1). Such a housing comprises an upper cover (2) and a lower cover (3), the upper cover and the lower cover are connected to form a cavity (5) inside of which is placed an electronic card (4). Such a housing is equipped with at least one antenna (51, 29, 39, 42, 45, 46) designed to communicate information to at least one electronic component (11) that is placed on the electronic card. To reduce the bulkiness of this housing equipped with such an antenna, the invention provides that the antenna be interposed between one of the covers and the card, and that at least one part of an external surface (47, 48) of the cover corresponding to a location of an internal surface (49, 50) of this same cover opposite from which is placed the antenna, is lacking metalizing.

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PCMCIA ELECTRONIC HOUSING EQUIPPED WITH AN ANTENNA AND
PROCESS FOR MANUFACTURING THEREOF.

The object of the present invention is a PCMCIA
5 (Personal Computer Memory Card International Association)
electronic housing equipped with an antenna. Another
object of the invention is a process for manufacturing
such a housing. More particularly, the invention finds
its utilization in the domain of housings designed to
10 contain a card meeting the criteria set by the PCMCIA
standard. Such electronic cards are widely utilized, more
particularly for adding memory capacity and/or
functionality to a computer, more particularly to
portable computers. These cards are present in housings
15 with a connector to a rear extremity of the housing, this
rear extremity meeting specific dimensional criteria.

A PCMCIA electronic housing comprises an electronic
card, an upper cover and a lower cover. The upper cover
20 and the lower cover are closed one on the other in such a
way as to delimit a cavity inside of which is placed the
electronic card. The electronic card carries at least one
electronic component that is connected to at least one
supply line printed on the card. This supply line allows
25 the component to be connected to an antenna. Such a
housing is designed to be inserted by its rear extremity
in a slot of an electronic apparatus, for example in a
slot of a computer. This slot then comprises a shape that
is adapted to the shape of a housing in such a way as to
30 maintain this housing relatively fixedly in the
apparatus. Within this slot, the component is
electrically connected through its connector to an
additional connector situated in the bottom of this slot.

35 In the prior art, adding an antenna extension to a
front part of the housing is known. The front part of the

housing comprises a connector designed to receive in correspondence another additional connector of an antenna extension module.

5 However, by adding this antenna extension to the front part of the housing, a bulky housing and a connection between the module and the housing that may be fragile is obtained.

10 To at least partially resolve these problems, the invention provides a PCMCIA electronic housing according to claim 1.

15 This housing is then formed of a single block equipped with at least one antenna placed within the cavity. The antenna is more specifically integrated in at least one of the covers. The antenna is placed within the cavity while being placed between one of the covers and the supply line.

20 A part of the external surface of at least one of the covers corresponding to a location of the antenna in the cavity of the housing is lacking metalizing. This part of the cover of the housing that is lacking
25 metalizing may thus allow the antenna to emit radiofrequency waves across this same cover.

 Furthermore, the housing according to the invention possibly comprises one and/or the other of the following
30 characteristics:

- the antenna is formed by a metal plate that is deformed according to the shape of the cover opposite from which the antenna is designed to be placed;
- the antenna is printed on a flexible support or
35 "flex" in such a way that it is possible to attach this flexible support on the cover while adapting the shape of

this flex and thus of this antenna to the shape of the corresponding cover;

- the antenna results from an impression of electrically conductive ink on the inner surface of at least one of the covers; this impression may be performed by electrodeposition (electrodeposition is understood to refer to a use of an electric current to deposit a metallic electrically conductive ink on a support); or rather this impression may be performed chemically or by using vacuum technologies; in the latter case the impression of ink by chemicals or vacuum does not require the use of electric current and is called the Electroless technique; for example, the antenna may be printed by MID (or Molded Interconnection Device) technology; by this latter MID technology, the antenna may be formed following selective impression of a catalytic ink (non conductive) on which the metalizing is done; or rather by this latter MID technology the antenna may be achieved following MID metalizing as such using etchings and chemical activations;

- the upper cover and lower cover are formed by molding a plastic material; one may then advantageously obtain an optimal utilization of the antenna formed by the conductive ink, or by the flex glued forming an integral part with the molded half shells due to the precision of the molding technique in general that allows coplanarity, parallelism and a constant strict distance between the entire surface of the element radiating the antenna and the plane of the mass to be obtained;

- the upper cover is formed by a front upper half shell and by a rear upper half shell; the lower cover is also formed of a front lower half shell and by a rear lower half shell; the front and rear half shells are connected to each other in correspondence by fitting one in the other according to an axis that is parallel to a plane formed by the electronic card; each of the rear

half shells is specifically placed opposite the electronic component; the front half shells are specifically placed opposite the antenna; thus, only each of the rear half shells is advantageously metalized while
5 at least one external surface of each of the front half shells is lacking metalizing; the rear half shells thus metalized then form an electromagnetic screen so as to protect the electronic component against the radiofrequency waves emitted or received by the antenna
10 and thus against the possible electromagnetic disturbances generated by the electronic apparatus itself; the external surface of the half shells may be partially metalized by going round the location of the antenna;

15 - the antenna may be connected to the corresponding supply line either by direct contact or by electromagnetic coupling; in the case where the connection of the antenna with the supply line is achieved by electromagnetic coupling, it is possible to
20 avoid, by soldering, a possible failure of the supply contacts; thus, despite the severity of the geometric constraints and reliability constraints in a PCMCIA card, the supply process of the antenna is simplified.

25 One may provide that the housing be inserted in the slot of the electronic apparatus in such a way that a part of the housing containing the antenna is placed outside of the apparatus. The part of the housing containing the antenna may then advantageously allow the
30 antenna to emit or receive radiofrequency waves without being disturbed by the electronic apparatus.

The invention also provides a process for manufacturing a PCMCIA housing according to claims 11 to
35 20.

The invention will be better understood upon reading the following description and examining the accompanying figures. These are given for indication purposes only and in no way limit the invention. The 5 figures show:

- Figure 1: an exploded view of a PCMCIA electronic housing according to the invention;
- Figures 2a to 2c: schematic representations of an antenna, according to a first variation of the invention;
- 10 - Figures 3a to 3b: schematic representations of an antenna, according to a second variation of the invention;
- Figure 4: a schematic representation of an antenna, according to a third variation of the invention.

15 Figure 1 represents an exploded schematic view of a PCMCIA electronic housing 1 according to the invention. The electronic housing 1 comprises an upper cover 2, a lower cover 3 and an electronic card 4.

20 Each of these covers 2 and 3 fixedly meet in such a way as to delimit a cavity 5. Each of the covers 2 and 3 comprises an external surface 47 or 48, and an internal surface 49 or 50. More specifically, the internal 25 surfaces 49 and 50 of each of the covers 2 and 3 delimits the cavity 5.

This cavity 5 allows the electronic card 4 to be enclosed between the two covers 2 and 3. The two covers are closed 30 one on the other by using fixation means. These fixation means may be for example at least one rod on one of the two covers and at least one stud 8 on the other cover. The stud 8 delimits an opening 9 in a shape that is complementary to the shape of the rod 7.

35

The electronic card 4 comprises a rigid flat substrate. The card 4 forms a plane 10 at the level of which are disposed at least one electronic component 11 and at least one conductive track (not represented) connecting
5 the component 11 to another component (not represented). The card 4 presents a front part 12 and a rear part 13. The rear part 13 is provided for being connected with a connector 14. The connector 14 is an interface allowing the card 4 to be connected to an additional connector of
10 the connector 14. For example, this additional connector is presented by an electronic apparatus, and is situated in a slot (not represented) that is provided to fixedly support the PCMCIA housing. This slot comprises a shape that is adapted to the shape of the housing to fixedly
15 maintain such a housing according to the invention in the electronic apparatus.

According to the invention, the PCMCIA housing also comprises at least one antenna 51, Figure 1. This antenna
20 51 is placed in the cavity 5 between the upper cover 2 and the lower cover 3. A supply line 15, printed on the card 4, allows the antenna 51 to be connected to the electronic component 11. The antenna 51 is placed in the cavity 5 while being connected to the supply line 15.

25 At least one location of the external surface 47, 48 of at least one of the covers 2, 3 corresponding to a location of internal surface 49, 50 of this same cover where the antenna 51 is placed is lacking metalizing. By
30 lacking metalizing, the same location of the external surface allows the antenna to transmit radiofrequency waves.

According to an embodiment of the invention, the upper
35 cover 2 is formed by a front upper half shell 16 and by a rear upper half shell 17. The lower cover 3 is formed by

a front lower half shell 18 and by a rear lower half shell 19. The front upper half shell 16 and the front lower half shell 18 are disposed one facing the other. The rear upper half shell 17 and the rear lower half shell 19 are also disposed facing each other.

Each of the front half shells 16, 18 and each of the corresponding rear half shells 17, 19 are connected to each other by fitting according to an axis that is parallel to the plane 10 of the card 4 for respectively forming the upper cover 2 and the lower cover 3. The upper cover 2 and the lower cover 3 thus formed are then connected by complementarity. For example, the upper cover 2 and the lower cover 3 are fitted one in the other according to an axis that is perpendicular to the plane 10 of the card by using at least one stud 8 and at least one rod 7 in correspondence as previously described.

According to the invention, the antenna 51 is placed between the front half shells 16, 18. More precisely, the antenna 51 is placed between one of the front half shells and the supply line 15 as represented in Figure 1.

The front upper half shell 16 and the rear upper half shell 17 respectively comprise an internal surface 20 and 21 on the one hand and an external surface 22 and 23 on the other hand. The front lower half shell 18 and the rear lower half shell 19 also respectively comprise an internal surface 24 and 25 on the one hand, and an internal [sic] surface 26 and 27 on the other hand. The front upper half shell 16 and the rear upper half shell 17 meet to form the upper cover 2 while forming a single external surface 47 and a single internal surface 49. The front lower half shell and the rear lower half shell meet to form the lower cover 3 while forming a single external surface 48 and a single internal surface 50.

To allow the antenna to emit or receive radiofrequency waves, the external surfaces 22 and 23 of the front half shells 16, 18 are lacking metalizing. More precisely, at
5 least one part of the external surface 22 and 23 of the front half shells 16, 18 corresponding to a location of the antenna on the internal surface 20, 21 of each of these same front half shells lacks metalizing. One may provide metalizing on the remainder of the external
10 surface of these front half shells 16, 18.

One may provide metalizing on the external surfaces 26 and 27 of the rear half shells 17, 19 to protect the operation of the electronic component 11 from possible
15 electromagnetic disturbances linked to the waves generated by the other components present at the surroundings of the PCMCIA housing.

According to a first variation of the invention, Figures
20 2a to 2c, the antenna is formed from a metal plate. Figure 2a represents such an antenna according to a perspective view. Figure 2b represents a bottom view of the housing and illustrates the position of the antenna with relation to the internal surface 20, 21 of the
25 corresponding front half shell 16, 18. Figure 2c illustrates a position of the antenna with relation to the external surface 22, 23 of one of the corresponding front half shells 16, 18.

30 The metal plate is transformed after die forging to form a thin sheet 29 comprising at least one flexible connection leg 30 in a globally triangular shape. This leg 30 has a curved extremity 31 forming a plane that is parallel to plane 10 of the card 4. This antenna
35 communicates with the component 11 through the leg 30 that is positioned with its curved extremity 31 by

resting against a supply line 54, Figures 2a and 2c. This thin sheet 29 is placed against the internal surface 20, 21 of one of the corresponding front half shells 16, 18, Figure 2b. The thin sheet 29 is advantageously
5 constructed in such a way that it is adapted to the shape of the corresponding front half shell.

To be attached to the front half shell, the thin sheet 29 comprises at least one fixation tab. In the example of
10 Figure 2b, this thin sheet 29 comprises four fixation tabs 31, 32, 33 and 34 designed to be inserted in an additional pin 35, 36, 37 and 38 respectively. In this example, the extremity 31 also forms a fixation tab. The pins 35, 36, 37 and 38 are formed by the corresponding
15 front half shell 16, 18. These pins stand perpendicularly with relation to a plane formed by this same front half shell. Each of the tabs may be folded to be hooked above the corresponding pin.

20 The connection leg 30 is attached to a pin 35 through the curved extremity 31 that may be fixedly hooked to the pin 35.

According to a second variation of the invention, Figures
25 3a to 3b, another type of antenna may be achieved. Figure 3a represents a partial exploded view of the housing. Figure 3b represents a bottom view of the housing and illustrates the position of an antenna 39 with relation to an internal surface 20, 21 of the corresponding front
30 half shell 16, 18. The antenna 39 is achieved after impression of a metal layer on a flexible support 40 or "flex." This flexible support is placed between one of the covers and the electronic card. Due to its deformable properties, the flexible support may then advantageously
35 be positioned and fixed against the internal surface of the corresponding front half shell while being adapted to

the shape of this same front half shell, whatever this shape may be.

In the example 3a, at least one of the front half shells 5 16, 18 comprises a recess 41 extending in a plane formed by this same front half shell while being directed according to a direction perpendicular to a direction extending from the front part 12 to the rear part 13 of the card. This recess 41 delimits from the front part 12 10 in the direction of the rear part 13, a first portion 52 and a second portion 53 of the corresponding front half shell. With relation to an axis that is perpendicular to the plane formed by the card, the first portion 52 is removed from the plane 10 formed by the card 4 and the 15 second portion 53 is close to the plane 10 formed by the card. The support as well as the recess 41 are achieved in such a way that the antenna 39 may be placed in contact of a supply line 43 when the upper cover 2 is closed on the lower cover 3. In this same example of 20 Figure 3a, the support 40 has a trapezoidal shape and the antenna 39 has a rectangular shape. But the support and the antenna may be of different shapes.

The antenna 39 may be connected to the line 43 by a 25 direct contact. The support then comprises a thickness that is measured according to an axis that is perpendicular to the plane 10 of the card 4, permitting the antenna 39 to be positioned in the contact of the supply line 43 when the upper cover 2 and the lower cover 30 3 are closed on each other. But the antenna 39 may also be connected to the line 43 without being placed in direct contact with the line 43 and the connection between this same antenna 39 and the line 43 may be achieved by electromagnetic coupling.

35

In this example, Figures 3a to 3b, the support is coated with a first antenna 39 and a second antenna 42. The first antenna 39 and the second antenna 42 are respectively connected to a first supply line 43 and to a
5 second supply line 44. But the first antenna 39 and the second antenna 42 may be respectively placed facing each other on the front upper half shell 16 and on the front lower half shell 18 while being separated from each other by the card 4. The antenna placed opposite a side of the
10 card 4 on which the supply line is not printed may communicate in this case with the line by electromagnetic coupling.

In a third variation of the invention, Figure 4, another
15 type of antenna 45 may be obtained by direct metalizing performed on the internal surface of at least one of the two front half shells.

The metalizing may be performed by electrodeposition. Or
20 rather the metalizing may be performed chemically or by using vacuum technologies. For example, the antenna may be achieved by MID technology.

The antenna forms a circle. In the example of Figure 4, a
25 first antenna 45 and a second antenna 46 are achieved by MID technology. Each of these antennas 45 and 46 is designed to be connected to a corresponding supply line (not represented) formed on the electric card 4. Such antennas 45, 46 are connected by electromagnetic coupling
30 as previously mentioned for the antenna formed on a flexible support.

MID technology may occur in at least one molding of a plastic piece to form at least one of the covers. Without
35 entering into detail, for implementing such technology a molded form (in plastic) having the required reliefs and

the shapes is achieved. One then proceeds with a selective etching of a surface of the molded part with activation of this surface, particularly with a catalyst such as copper or palladium that may possibly be
5 integrated in the plastic mass or be produced separately with the chemical solutions or vacuum technologies. The selective etching may be achieved for example following a previous photomasking. After this etching, a metalizing layer is achieved. The metalizing layer obtained adopts
10 the geometry of the etched surfaces. Particularly, the external surface of each of the covers 2 and 3 may be metalized by this MID technology.

Furthermore, the antennas 45 and 46 may be obtained by
15 this MID technology.

By this MID technology, each of the covers may be molded and the external surface of each of the covers may be partially metalized while going round the corresponding
20 location of the antenna.

According to this MID technology, it is possible to achieve in the third variation of the invention, Figure 4, a first molding of a first plastic material M1 to form
25 the cover 2, 3. Then a second molding of a second plastic material M2 is achieved. This second plastic material M2 will be specifically used to achieve at least one antenna 45. In fact, this second plastic material M2 is at least partially metalized to form the antenna. In this case,
30 the second plastic material may comprise a thickness achieved in such a way that the printed antenna is placed in direct contact with the corresponding supply line when the upper cover and lower cover are closed one on the other.

35

Generally, the covers 2 and 3 may be achieved by molding. Thus, one may then advantageously obtain an optimal utilization of the antenna formed by the conductive ink, or by the glued flex forming an integral part with the 5 molded half shells due to the precision of the molding technique in general that allows coplanarity, parallelism and a constant strict distance between the entire surface of the element radiating the antenna and the plane of the mass to be obtained.

10

The manufacturing process of such a housing is the following. The upper cover 2 is achieved by forming a front upper half shell 16 and a rear upper half shell 17. The lower cover 3 is achieved by forming a front lower 15 half shell 18 and a rear lower half shell 19. At least one antenna 51, 29, 39, 42, 45, 46 is then achieved.

In the case where the antenna is formed from a metal plate, the plate is deformed to form an antenna 29 that 20 is placed so as to rest against the internal surface 20, 21 of one of the two front half shells 16, 18.

In the case where the antenna is formed on a flex 40, at least one antenna 39, 42 is printed on the flex, then the 25 flex is glued on the internal surface 20, 21 of one of the two front half shells 16, 18 while adapting the shape of the flex to the shape of the corresponding front half shell and while placing the antenna opposite the corresponding supply line 43, 44.

30

In the case where the antenna is achieved directly on the front half shell, the internal surface 20, 21 of the corresponding front half shell of the cover is partially metalized to form the antenna 45, 46 by electrodeposition 35 or chemical means or by vacuum as previously mentioned.

Then the electronic component 11 is placed on the electronic card 4 and this component is connected to the corresponding supply line.

- 5 Then the front upper half shell 16 is connected to the rear upper half shell 17 according to an axis that is parallel to the plane of the card 4 to form the upper cover 2 and the front lower half shell 18 is connected to the rear lower half shell 19 according to an axis that is
10 parallel to the plane of the card 4 to form the lower cover 3.

- Lastly, the upper cover 2 is connected to the lower cover 3 according to an axis that is perpendicular to the plane
15 formed by the card to form the cavity while placing the antenna 51, 29, 39, 42, 45, 46 between the corresponding supply line and the front half shell while placing the component 11 between the two rear half shells.

- 20 Lastly, the connector 14 is inserted against the rear part 13 of the card 4.

- The housing thus formed may then be inserted by the part 13 in a slot (not represented) of an electronic apparatus
25 (not represented). The connector 14 is connected with an additional connector placed in the bottom of the slot. The housing may be inserted in such a way that the part of the housing comprising the antenna is placed outside of the slot. By being placed outside of the slot, the
30 antenna may then receive or emit radiofrequency waves without being disturbed by the electronic apparatus.

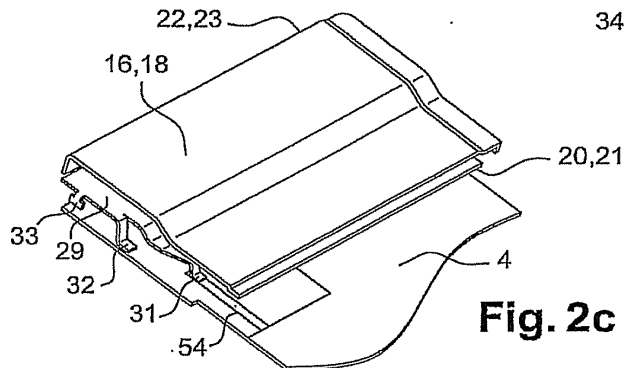
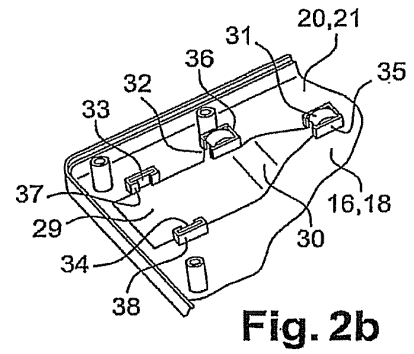
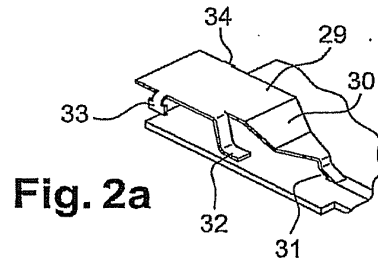
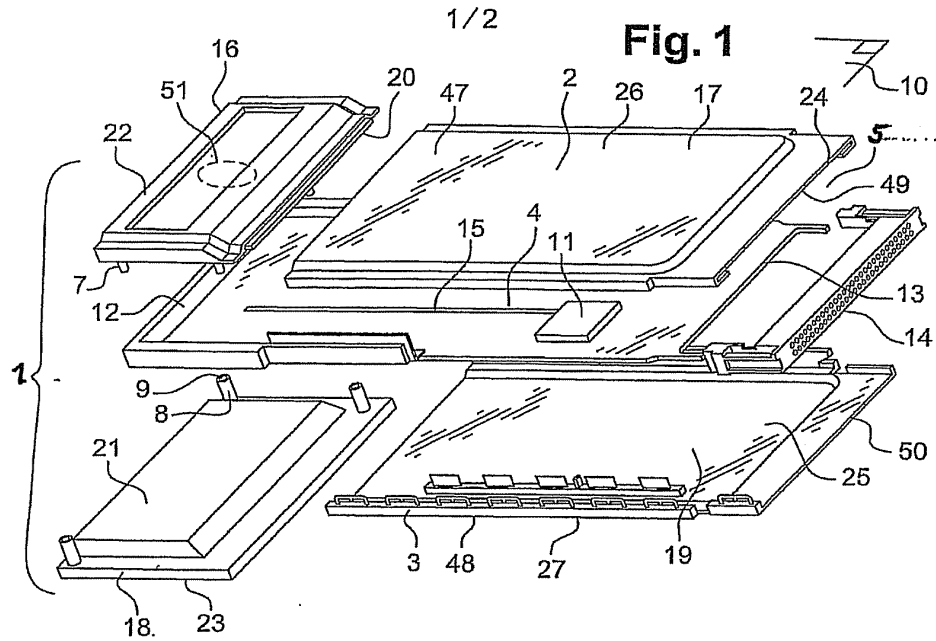
CLAIMS

1. A PCMCIA electronic housing comprising
 - an upper (2) and a lower (3) cover, the upper and lower covers delimiting a cavity (5) of the housing,
5 each of the covers delimiting an external surface (47, 48) and an internal surface (49, 50), the internal surface delimiting the cavity, and
 - an electronic card (4) disposed in the cavity and on which is placed at least one electronic component
10 (11), characterized in that
 - at least one antenna (51) is placed in the cavity while being connected to the electronic component by a supply line (15, 54, 43, 44) and while being placed between at least one of the covers and the
15 supply line, and
 - at least one location of the external surface of at least one of the covers corresponding to a location of the internal surface of this same cover opposite from which is placed the antenna, is
20 lacking metalizing.
2. The housing according to claim 1, in which the upper cover and the lower cover are each formed of a front half shell (16, 18) and by a rear half shell (17, 19), the electronic component being situated between
25 the rear upper half shell (17) and the rear lower half shell (19) and the antenna being situated between the front upper half shell (16) and the front lower half shell (18).
3. The housing according to one of claims 1 to 2, in
30 which the antenna is formed of a metal plate that is positioned resting against the internal surface of the corresponding cover.
4. The housing according to one of claims 1 to 3, in which

- at least one of the covers comprises at least one pin (35, 36, 37, 38) standing perpendicularly with relation to a plane formed by the cover, and
- the antenna comprises at least one connection leg
5 (30) and at least one fixation tab (31, 32, 33, 34), the connection leg is connected to the supply line (54) and the fixation tab is attached to the corresponding pin (35, 36, 37, 38) to maintain the antenna on the corresponding cover.
- 10 5. The housing according to one of claims 1 to 4, in which the antenna (39, 42) is printed on a flexible support (40), the flexible support being attached to the corresponding cover in such a way that the antenna is placed opposite the supply line (43, 44).
- 15 6. The housing according to one of claims 1 to 5, in which the internal surface (49, 50) of the cover is partially metalized to form the antenna, the cover being metalized in such a way that the antenna is placed facing the supply line.
- 20 7. The housing according to claim 6, in which the antenna is formed by electrodeposition.
- 8. The housing according to claim 6, in which the antenna is formed by impression of electrically conductive ink by chemical means or by vacuum
25 technology.
- 9. The housing according to claim 6, in which the antenna is formed by MID technology.
- 10. The housing according to one of claims 1 to 9, in which the housing is inserted in an electronic
30 apparatus in such a way that the part of the housing comprising the antenna is placed outside of the apparatus.
- 11. A process for manufacturing a PCMCIA housing, comprising the following steps
35 - an upper cover (2) and a lower cover (3) are achieved,

- at least one electronic component is placed on an electronic card (4), the component being connected to a supply line (15, 43, 44) achieved on the card, characterized by the fact that
- 5 - at least one antenna (51, 29, 39, 42, 45, 46) is achieved, and that
- the upper cover is connected to the lower cover to form a cavity (5) inside of which is placed the card while connecting the antenna to the supply
- 10 line.
- 12. The process according to claim 11, in which
- an external surface (47, 48) of at least one of the covers is metalized while going round a location of the external surface corresponding to a location
- 15 of the internal surface (49, 50) opposite from which is placed the antenna.
- 13. The process according to one of claims 11 and 12, characterized in that
- a front upper half shell (16) and a rear upper
- 20 half shell (17) are achieved,
- a front lower half shell (18) and a rear lower half shell (19) are achieved,
- the front upper half shell is connected to the rear upper half shell to form the upper cover (2)
- 25 according to an axis that is parallel to a plane formed by the card,
- the front lower half shell is connected to the rear lower half shell to form the lower cover (3), according to an axis that is parallel to a plane
- 30 formed by the card, and
- the upper cover and lower cover are closed one on the other while placing the antenna between the front upper half shell and the front lower half shell.
- 35 14. The process according to one of claims 11 to 13, in which

- a metal plate is cut,
 - the plate is deformed to achieve an antenna (29),
such an antenna being adapted to the shape of the
corresponding cover while being placed against the
internal surface (49, 50) of this same cover, and
while being connected to the supply line (54).
15. The process according to one of claims 11 to 14, in
which
- at least one antenna (39, 42) is printed on a
flexible support (40), and
 - the flexible support is fixed against the
internal surface of the corresponding cover, while
connecting the antenna to the supply line.
16. The process according to one of claims 11 to 15, in
which the internal surface of at least one of the
covers is partially metalized to form the antenna.
17. The process according to claim 16, characterized in
that the metalizing is achieved by
electrodeposition.
18. The process according to claim 16, characterized in
that the metalizing is achieved by chemical means or
by vacuum technology.
19. The process according to claim 16, characterized in
that the antenna is achieved by MID technology.
20. The process according to claims 11 to 19, in which
the housing is inserted in an electronic apparatus
in such a way that the part of the housing
comprising the antenna is placed outside of the
apparatus.



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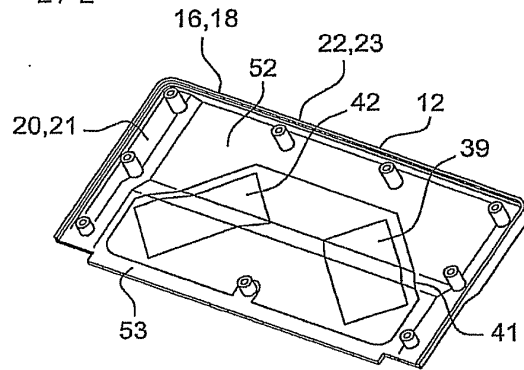


Fig. 3b

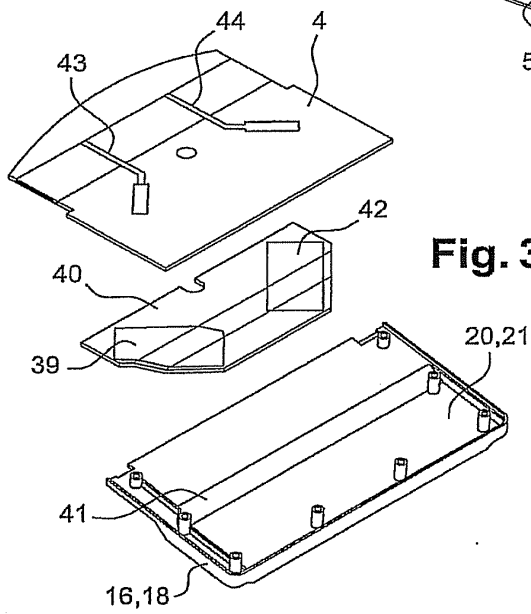


Fig. 3a

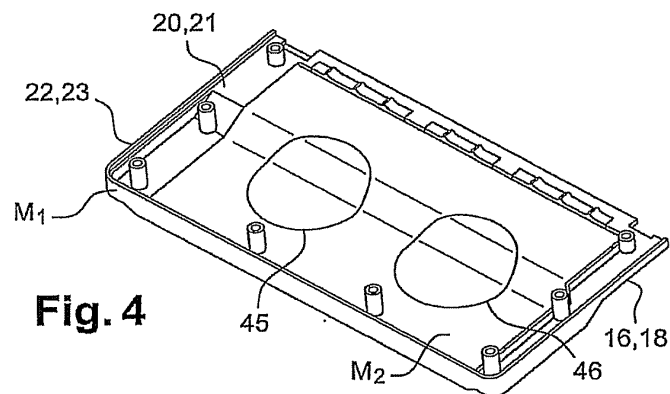


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2005/000192

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01Q1/22 H01Q1/38 G06K19/077

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01Q H04B G06K G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 031 503 A (PREISS, II ET AL) 29 February 2000 (2000-02-29) the whole document	1-3,6, 8-10
X	FR 2 812 167 A (FCI BESANCON S.A) 25 January 2002 (2002-01-25) the whole document	1,2,10, 11,13,20
X	WO 01/37437 A (PSION CONNECT LIMITED; WOLOVITZ, LIONEL; HORAN, RICHARD, J) 25 May 2001 (2001-05-25) the whole document	1,2,6,8, 10
X	US 5 510 959 A (DERSTINE ET AL) 23 April 1996 (1996-04-23) the whole document	1,2,10
	----- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the International filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the International filing date but later than the priority date claimed

T later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

13 May 2005

Date of mailing of the international search report

31/05/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
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Fax: (+31-70) 340-3016

Authorized officer

Wattiaux, V

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2005/000192

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 104 617 A (SCHREMMER ET AL) 15 August 2000 (2000-08-15)	1,2,10
Y	the whole document	5-9
Y	US 6 518 929 B1 (GILMORE ROBERT P) 11 February 2003 (2003-02-11)	5-9
	the whole document	
X	US 5 936 584 A (LAWRENCE ET AL) 10 August 1999 (1999-08-10)	1,2,10
Y	the whole document	6
Y	US 2003/174092 A1 (SULLIVAN JONATHAN LEE ET AL) 18 September 2003 (2003-09-18) abstract	6

Form PCT/ISA/210 (continuation of second sheet) (January 2004)

page 2 of 2

INTERNATIONAL SEARCH REPORT

 International Application No
 PCT/EP2005/000192

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6031503	A	29-02-2000	AU 6178698 A WO 9837590 A2	09-09-1998 27-08-1998
FR 2812167	A	25-01-2002	FR 2812167 A1 AT 273609 T CA 2416048 A1 CN 1443436 A DE 60104855 D1 WO 0207489 A1 EP 1302095 A1 JP 2004516643 T US 2004008502 A1	25-01-2002 15-08-2004 24-01-2002 17-09-2003 16-09-2004 24-01-2002 16-04-2003 03-06-2004 15-01-2004
WO 0137437	A	25-05-2001	EP 1221203 A2 WO 0137437 A2 GB 2357189 A ,B GB 2357190 A ,B JP 2003514482 T	10-07-2002 25-05-2001 13-06-2001 13-06-2001 15-04-2003
US 5510959	A	23-04-1996	EP 0823194 A1 JP 2000514240 T WO 9637091 A1	11-02-1998 24-10-2000 21-11-1996
US 6104617	A	15-08-2000	DE 19710515 C1 DE 59811728 D1 EP 0865233 A2	20-08-1998 09-09-2004 16-09-1998
US 6518929	B1	11-02-2003	AU 3526802 A WO 0235643 A2 US 2003210194 A1	06-05-2002 02-05-2002 13-11-2003
US 5936584	A	10-08-1999	US 5815120 A	29-09-1998
US 2003174092	A1	18-09-2003	NONE	

Form PCT/ISA/210 (patent family annex) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/066345

A. CLASSIFICATION OF SUBJECT MATTER		
<i>H01Q 21/12(2006.01)i, H01Q 21/06(2006.01)i, H01Q 19/10(2006.01)i, H04M 1/00(2006.01)i, G01S 13/00(2006.01)i</i>		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) H01Q 21/12; H01Q 1/38; H01Q 3/00; H01Q 5/00; H04M 1/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean utility models and applications for utility models Japanese utility models and applications for utility models		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS(KIPO internal) & Keywords: panel, antenna, radome, enclosure		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2007-0001919 A1 (NIALLO CARROLL et al.) 04 January 2007 See Abstract, Claims 1-18, Figures 1-8 Description of the Preferred Embodiments	1-18
A	WO 2009-011601 A1 (TIMES-7 HOLDINGS LIMITED et al.) 22 January 2009 See Abstract, Claims 1-5, Figures 1-21 Detailed Description of the Invention	1-18
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 25 JUNE 2010 (25.06.2010)		Date of mailing of the international search report 25 JUNE 2010 (25.06.2010)
Name and mailing address of the ISA/KR  Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer LEE, Saang Woong Telephone No. 82-42-481-8210 

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/066345

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007-0001919 A1	04.01.2007	EP 1851825 A1	07.11.2007
		GB 0426319 D0	05.01.2005
		WO 2006-059230 A1	08.06.2006
		WO 2006-059230 A1	08.06.2006
WO 2009-011601 A1	22.01.2009	AU 2008-276731 A1	22.01.2009

Form PCT/ISA/210 (patent family annex) (July 2009)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

DANIEL M. GURFINKEL

HUSCH BLACKWELL SANDERS WELSH & KATZ 120
SOUTH RIVERSIDE PLAZA SUITE 2200 CHICAGO IL
60606 USA

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) 25 JUNE 2010 (25.06.2010)

Applicant's or agent's file reference
7836-107560-PCT

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2009/066345

International filing date (day/month/year)

02 DECEMBER 2009 (02.12.2009)

Priority date (day/month/year)

02 DECEMBER 2008 (02.12.2008)

International Patent Classification (IPC) or both national classification and IPC

H01Q 21/12(2006.01)i, H01Q 21/06(2006.01)i, H01Q 19/10(2006.01)i, H04M 1/00(2006.01)i, G01S 13/00(2006.01)i

Applicant

ANDREW LLC et al

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR  Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302 701 Republic of Korea Facsimile No. 82-42-472-7140	Date of completion of this opinion 25 JUNE 2010 (25.06.2010)	Authorized officer LEE, Saang Woong Telephone No. 82-42-481-8210 
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Form PCT/ISA/237 (cover sheet) (July 2009)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2009/066345

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of :
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. a sequence listing filed or furnished
 - ☐ on paper
 - ☐ in electronic form
 - b. time of filing or furnishing
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
5. ☐ In addition, in the case that more than one version or copy of a sequence listing as been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2009/066345

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-18	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	1-18	YES
	Claims	NONE	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims	NONE	NO

2. Citations and explanations :

A. Reference is made to the following documents:

Reference is made to the following documents identified in the International Search Report(ISR):

D1: US 2007-0001919 A1 (NIALLO CARROLL et al.) 04 January 2007
D2: WO 2009-011601 A1 (TIMES-7 HOLDINGS LIMITED et al.) 22 January 2009

B. Reasoned statement with regard to novelty and inventive step:

1. Novelty and Inventive step regarding claims 1-18:

D1, which is considered to represent the most relevant state of the art, discloses an antenna assembly for a cellular telecommunications system having an array of radiating elements, patches, situated in front of a panel having an electrically conductive face, from which the subject matter of claims 1, 12, 16 differs in that a panel antenna comprising an enclosure including a rectangular rear panel and first, second, third walls extended from longitudinal edges and those walls, an inner seal, a plurality of micro radios, a radome, and these are not disclosed in D1, accordingly, are also considered to be not obvious to a person skilled in the art by D1 or D2, taken alone or in combination.

Claims 2-11 are dependent on claim 1, claims 13-15 on claim 12, claims 17-18 on claim 16, therefore the claims meet the requirements of novelty and inventive step.

Therefore, the subject matter of claims 1-18 is being considered to be novel and to involve an inventive step under PCT Article 33(2) and (3).

C. Reasoned statement with regard to industrial applicability

Claims 1-18 meet the criteria set out in PCT Article 33(4), because all the claims are considered to be industrially applicable.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/037088

A. CLASSIFICATION OF SUBJECT MATTER

H01Q 21/08(2006.01)i, H01Q 1/42(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01Q 21/08; G06F 15/16; H04J 3/22; H04B 7/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: antenna, cavity, enclosure, cover, radome, heat

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006-119454 A1 (MEDIACELL LICENSING CORP et al.) 09 November 2006 See the abstract; figures 1-3; page 3 line 31 - page 7 line 32; and claims 1-18	1-8
A	US 2005-0104792 A1 (ASAO, HIDEKI et al.) 19 May 2005 See the abstract; figures 1-2; paragraphs 21-25; and claims 1-5	1-8
A	WO 2005-069432 A1 (FCI et al.) 28 July 2005 See the abstract; figures 1-4; page 6 line 18 - page 14 line 31; and claims 1-10	1-8
A	US 2006-0109188 A1 (IKEDA, IENOBU et al.) 25 May 2006 See the abstract; figures 1-2; paragraphs 135-190; and claims 1-17	1-8

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

28 DECEMBER 2010 (28.12.2010)

Date of mailing of the international search report

29 DECEMBER 2010 (29.12.2010)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

Kim Jeong Seok

Telephone No. 82-42-481-8481



Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US2010/037088

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006-119454 A1	09.11.2006	CA 2607167-A1 EP 1989933 A1 WO 2006-119454 A1	09.11.2006 12.11.2008 09.11.2006
US 2005-0104792 A1	19.05.2005	JP 03-829839 B2 JP 2005-150345 A US 6977620 B2	04.10.2006 09.06.2005 20.12.2005
WO 2005-069432 A1	28.07.2005	FR 2865099 A1	15.07.2005
US 2006-0109188 A1	25.05.2006	CN 1701464 A CN 1701464 C0 DE 602004025098 D1 EP 1624525 A1 EP 1624525 A4 EP 1624525 B1 JP 04-143693 B2 JP 2004-340700 A JP 2004-343625 A KR 10-2006-0021282 A US 2006-109188 A1 US 7321337 B2 WO 2004-102738 A1	23.11.2005 23.11.2005 04.03.2010 08.02.2006 19.07.2006 13.01.2010 03.09.2008 02.12.2004 02.12.2004 07.03.2006 25.05.2006 22.01.2008 25.11.2004

Form PCT/ISA/210 (patent family annex) (July 2009)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:
DANIEL M. GURFINKEL

HUSCH BLACKWELL SANDERS WELSH & KATZ 120 S.
RIVERSIDE PLAZA, SUITE 2200 CHICAGO IL 60606 USA

Date of mailing
(day/month/year) 29 DECEMBER 2010 (29.12.2010)

Applicant's or agent's file reference
7836-107560-PCT2

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2010/037088

International filing date (day/month/year)
02 JUNE 2010 (02.06.2010)

Priority date(day/month/year)
02 DECEMBER 2009 (02.12.2009)

International Patent Classification (IPC) or both national classification and IPC

H01Q 21/08(2006.01), H01Q 1/42(2006.01)

Applicant
ANDREW LLC et al

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

 Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302 -701, Republic of Korea Facsimile No. 82-42-472-7140	Date of completion of this opinion 28 DECEMBER 2010 (28.12.2010)	Authorized officer Kim Jeong Seok Telephone No.82-42-481-8481 
---	---	--

Form PCT/ISA/237 (cover sheet) (July 2009)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2010/037088

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of:

a. a sequence listing filed or furnished

- ☐ on paper
- ☐ in electronic form

b. time of filing or furnishing

- ☐ contained in the international application as filed.
- ☐ filed together with the international application in electronic form.
- ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2010/037088

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-8	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-8	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims	NONE	NO

2. Citations and explanations :

1. Prior Art

Reference is made in the present opinion to the following document cited in the search report. The numbering is also retained in the further procedure:

D1: WO 2006-119454 A1 (MEDIACELL LICENSING CORP et al.) 09 November 2006

D2 : US 2005-0104792 A1 (ASAO, HIDEKI et al.) 19 May 2005

D1 discloses an antenna system comprising: an enclosure consists of a door, housing, electrical equipment and a first ground plane; a second ground plane; antennas; and a radome.

D2 discloses high frequency package comprising: a plurality of apertures as antennas; a metal frame; a microwave circuitry; and a metal bottom plate.

2. Novelty and Inventive Step (PCT Articles 33(2) and 33(3))

The subject matter of claim 1 of the present invention relates to a panel antenna comprising: a cavity enclosure including a rear panel, a first side wall, a second side wall, a top wall and a bottom wall; an internal cover; a micro radio mounted to an internal surface of the first side wall; a first heat sink; and a radome mounting to the internal cover and enclosing the RF radiating module.

Document D1 is regarded as the closest prior art to the subject matter of claim 1. The structure of the cavity enclosure, the internal cover, the micro radio, the radome, and the RF radiating module of claim 1 correspond respectively to the enclosure, the second ground plane, the electrical equipment, the radome, and the antennas of D1. D1 does not disclose the heat sink. Therefore, the subject matter of claim 1 is considered to be novel under PCT Article 33(2). The addition of the heat sink to the panel antenna comes within the scope of the customary practice followed by a person skilled in the art. Therefore, the subject matter of claim 1 cannot be considered as involving an inventive step under PCT Article 33(3).

Claims 2-8 are dependent on claim 1 of the present application. The additional features of claims 2-8 can be anticipated by document D1 or come within the scope of the customary practice followed by a person skilled in the art. Therefore, the subject matter of claims 2-8 is considered to be novel but cannot be considered as involving an inventive step under PCT Article 33(2) and 33(3).

3. Industrial Applicability (PCT Article 33(4))

Claims 1-8 of the present application meet the criteria set out in PCT Article 33(4), because the subject matter of claims 1-8 is considered to be industrially applicable.

Electronic Acknowledgement Receipt	
EFS ID:	9422245
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Gerald T. Shekleton
Filer Authorized By:	
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	10-FEB-2011
Filing Date:	02-JUN-2010
Time Stamp:	18:19:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		107560cip.pdf	5759159	yes	61
			e00324b13e975bffa891d77aa3f412d616d5edd		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Transmittal Letter	1	2
	Information Disclosure Statement (IDS) Filed (SB/08)	3	4
	Foreign Reference	5	26
	Foreign Reference	27	51
	NPL Documents	52	56
	NPL Documents	57	61
Warnings:			
Information:			
Total Files Size (in bytes):		5759159	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.			

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	12/792,367	)	Confirmation No.: 4588
Applicant:	RODGER et al.	)	
Filed:	2 June 2010	)	
Art Unit:	2821	)	
Examiner:	To be assigned	)	
Docket No.:	7836-107560-CIP	)	
Customer No.:	24628	)	
Title:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE	)	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Dear Sir:

Applicant submits herewith information of which he is aware, which it is believed may be material to the examination of this application and in respect of which there may be a duty to disclose in accordance with 37 CFR 1.56. However, submitting this information is not intended to constitute an admission that any patent, publication or other information referred to herein either is "material" pursuant to 37 CFR 1.56 or is "prior art" for this invention.

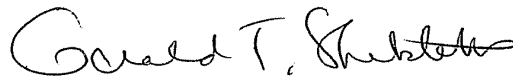
In accordance with 37 CFR 1.97(g), (h), the filing of the Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR 1.56(b) exists.

A list of patent(s) and/or publications is set forth on the attached forms PTO/SB/08A and PTO/SB/08B. Copies of all foreign patents and non-patent literature are supplied herewith for the Examiner's convenience.

It is respectfully submitted that the present invention is deemed patentable over the cited references, whether taken singly or in combination. Applicants are submitting these references for consideration by the Examiner and for purposes of entering these citations in the official file in order to comply with their duty of candor.

If a fee is due, the Patents Office is authorized to debit our deposit account No. 230920.

Respectfully Submitted,



Date: 10 February 2011

Gerald T. Shekleton
Registration No. 27,466
Husch Blackwell LLP
120 South Riverside Plaza
22nd Floor
Chicago, Illinois 60606-3912
(312) 655-1500



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
12/792,367	06/02/2010	2821	1220	7836-107560-CIP	8	1

CONFIRMATION NO. 4588

UPDATED FILING RECEIPT



0000000044178015

24628
Husch Blackwell Sanders, LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606

Date Mailed: 10/29/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Derek RODGER, Inverkeithing, UNITED KINGDOM;
Matthew FERRIS, Plano, TX;

Assignment For Published Patent Application

ANDREW LLC, Hickory, NC

Power of Attorney: The patent practitioners associated with Customer Number 24628

Domestic Priority data as claimed by applicant

This application is a CIP of PCT/US09/66345 12/02/2009
which claims benefit of 61/119,114 12/02/2008

Foreign Applications

If Required, Foreign Filing License Granted: 06/15/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/792,367**

Projected Publication Date: 02/10/2011

Non-Publication Request: No

Early Publication Request: No

Title

PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

Preliminary Class

343

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER**Title 35, United States Code, Section 184****Title 37, Code of Federal Regulations, 5.11 & 5.15****GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

page 2 of 3

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

Electronic Acknowledgement Receipt	
EFS ID:	8644555
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Invent date: 10/21/2010 MTEKLEMI 2010 INTEFSW 00000952 230920 12792367 1253 1110.00 CR Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
2010 MTEKLEMI 00000038 230920 12792367 1111 540.00 DA 1311 220.00 DA 1252 490.00 DA	
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Gerald T. Shekleton/Richard Sensenbrenner
Filer Authorized By:	Gerald T. Shekleton
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	18-OCT-2010
Filing Date:	02-JUN-2010
Time Stamp:	14:45:59
Application Type:	Utility under 35 USC 111(a)

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$1570
RAM confirmation Number	952
Deposit Account	230920
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	: 12/792,367	)	Confirmation No.:	4588
Applicant	: RODGER et al.	)	Filed	: 2 June 2010
Docket No.	: 7836-107560-CIP	)	Art Unit	: 2821
Customer No.:	24628	)	Examiner	: To be assigned
Title:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE	)		

Response to Notice to File Missing Parts of Nonprovisional Application

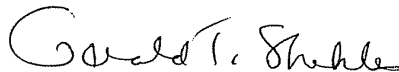
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

Enclosed in response to the NOTICE TO FILE MISSING PARTS OF
NONPROVISIONAL APPLICATION, dated 16 June 2008 in connection with the above identified
application please find:

- [X] Executed Declaration and Power of Attorney
- [X] Form PTO/SB22
- [X] Authorization for the Commissioner to charge Deposit Account 23-0920 in the amount of \$1,110.00 to extend period of filing
- [X] Authorization for the Commissioner to charge Deposit Account 23-0920 in the amount of \$330.00 for the statutory basic filing fee
- [X] Authorization for the Commissioner to charge Deposit Account 23-0920 in the amount of \$130.00 surcharge
- [X] Authorization for the Commissioner to credit any overpayments or debit any outstanding fees for the subject application to Deposit Account 23-0920.

Respectfully submitted,
Husch Blackwell Sanders Welsh & Katz



Gerald T. Shekleton
Reg. No. 27,466

18 October 2010
Husch Blackwell Sanders Welsh Katz
120 S. Riverside Plaza, 22nd Floor
Chicago, Illinois 60606
Telephone: 312 655 1500

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare:

That my residence, post office address and citizenship are as stated below next to my name.

That I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

the specification of which (check one)

☐ is attached hereto.

☒ was filed on 2 June 2010 as

Application Serial No. 12/792,367

and was amended on _____

(if applicable)

That I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

That I acknowledge the duty to disclose information known to be material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

That I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate on this invention having a filing date before that of the application on which priority is claimed:

Number	Country	Day/Month/Year Filed	Priority Claimed

Atty. Docket No. 7836-107560-CIP

That all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

POWER OF ATTORNEY

I hereby appoint the attorneys associated with Customer Number **24628**, of the law firm of **HUSCH BLACKWELL SANDERS WELSH & KATZ** with full power of substitution and revocation, to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith.

CORRESPONDENCE ADDRESS

The address associated with Customer Number: **24628** (Husch Blackwell Sanders Welsh & Katz Phone: (312) 655-1500)

Should be used for all correspondence in this application.

Atty. Docket No. 7836-107560-CIP

Full name of sole or first joint inventor: Derek RODGER

Inventor's signature: _____

Date: _____

Mailing Address: 2, Scotmill Way
Inverkeithing
Fife, Scotland KY11 1DG

Residence: UK

Citizenship: UK

Full name of sole or second joint inventor: Matthew FERRIS

Inventor's signature:  _____

Date: 7-23-2010

Mailing Address: 7713 Brushfield Drive
Plano, Texas 75025

Residence: US

Citizenship: US

Additional pages listing additional inventors attached No

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare:

That my residence, post office address and citizenship are as stated below next to my name.

That I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

the specification of which (check one)

☐ is attached hereto.

☒ was filed on 2 June 2010 as

Application Serial No. 12/792,367

and was amended on _____

(if applicable)

That I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

That I acknowledge the duty to disclose information known to be material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

That I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate on this invention having a filing date before that of the application on which priority is claimed:

Number	Country	Day/Month/Year Filed	Priority Claimed

Atty. Docket No. 7836-107560-CIP

That all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

POWER OF ATTORNEY

I hereby appoint the attorneys associated with Customer Number **24628**, of the law firm of **HUSCH BLACKWELL SANDERS WELSH & KATZ** with full power of substitution and revocation, to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith.

CORRESPONDENCE ADDRESS

The address associated with Customer Number: **24628** (Husch Blackwell Sanders
Welsh & Katz Phone: (312) 655-1500)

Should be used for all correspondence in this application.

Atty. Docket No. 7836-107560-CIP

Full name of sole or first joint inventor: Derek RODGER

Inventor's signature: D. Rodger

Date: 8-July-2010

Mailing Address: 2, Scotmill Way
Inverkeithing
Fife, Scotland KY11 1DG

Residence: UK

Citizenship: UK

Full name of sole or second joint inventor: Matthew FERRIS

Inventor's signature: _____

Date: _____

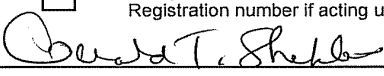
Mailing Address: 7713 Brushfield Drive
Plano, Texas 75025

Residence: US

Citizenship: US

Additional pages listing additional inventors attached **No**

Under the paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) FY 2009 <i>(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)</i>		Docket Number (Optional) 7836-107560-CIP																								
Application Number 12/792,367		Filed 2 June 2010																								
For PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE																										
Art Unit 2821		Examiner To be assigned																								
This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application. The requested extension and fee are as follows (check time period desired and enter the appropriate fee below): <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="width: 20%; text-align: center;"><u>Fee</u></th> <th style="width: 20%; text-align: center;"><u>Small Entity Fee</u></th> <th style="width: 20%;"></th> </tr> </thead> <tbody> <tr> <td>☐ One month (37 CFR 1.17(a)(1))</td> <td style="text-align: center;">\$130</td> <td style="text-align: center;">\$65</td> <td style="text-align: center;">\$ _____</td> </tr> <tr> <td>☐ Two months (37 CFR 1.17(a)(2))</td> <td style="text-align: center;">\$490</td> <td style="text-align: center;">\$245</td> <td style="text-align: center;">\$ _____</td> </tr> <tr> <td>☒ Three months (37 CFR 1.17(a)(3))</td> <td style="text-align: center;">\$1110</td> <td style="text-align: center;">\$555</td> <td style="text-align: center;">\$ <u>1,110.00</u></td> </tr> <tr> <td>☐ Four months (37 CFR 1.17(a)(4))</td> <td style="text-align: center;">\$1730</td> <td style="text-align: center;">\$865</td> <td style="text-align: center;">\$ _____</td> </tr> <tr> <td>☐ Five months (37 CFR 1.17(a)(5))</td> <td style="text-align: center;">\$2350</td> <td style="text-align: center;">\$1175</td> <td style="text-align: center;">\$ _____</td> </tr> </tbody> </table> ☐ Applicant claims small entity status. See 37 CFR 1.27. ☐ A check in the amount of the fee is enclosed. ☐ Payment by credit card. Form PTO-2038 is attached. ☐ The Director has already been authorized to charge fees in this application to a Deposit Account. ☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number <u>23-0920</u>. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. I am the ☐ applicant/inventor. ☐ assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96). ☒ attorney or agent of record. Registration Number <u>27,466</u> ☐ attorney or agent under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____  _____ Signature <u>18 October 2010</u> _____ Date <u>Gerald T. SHEKELTON</u> _____ Typed or printed name <u>312-655-1500</u> _____ Telephone Number NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below. ☒ Total of <u>1</u> forms are submitted.				<u>Fee</u>	<u>Small Entity Fee</u>		☐ One month (37 CFR 1.17(a)(1))	\$130	\$65	\$ _____	☐ Two months (37 CFR 1.17(a)(2))	\$490	\$245	\$ _____	☒ Three months (37 CFR 1.17(a)(3))	\$1110	\$555	\$ <u>1,110.00</u>	☐ Four months (37 CFR 1.17(a)(4))	\$1730	\$865	\$ _____	☐ Five months (37 CFR 1.17(a)(5))	\$2350	\$1175	\$ _____
	<u>Fee</u>	<u>Small Entity Fee</u>																								
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☐ Five months (37 CFR 1.17(a)(5))	\$2350	\$1175	\$ _____																							

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a) FY 2009 <i>(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)</i>		Docket Number (Optional) 7836-107560-CIP
Application Number 12/792,367		Filed 2 June 2010
For PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE		
Art Unit 2821		Examiner To be assigned

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	<u>Fee</u>	<u>Small Entity Fee</u>	
☐ One month (37 CFR 1.17(a)(1))	\$130	\$65	\$ _____
☐ Two months (37 CFR 1.17(a)(2))	\$490	\$245	\$ _____
☒ Three months (37 CFR 1.17(a)(3))	\$1110	\$555	\$ <u>1,110.00</u>
☐ Four months (37 CFR 1.17(a)(4))	\$1730	\$865	\$ _____
☐ Five months (37 CFR 1.17(a)(5))	\$2350	\$1175	\$ _____

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 23-0920.

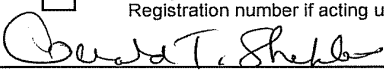
WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the ☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☒ attorney or agent of record. Registration Number 27,466

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____



 Signature

 Date

Gerald T. SHEKELTON

 Typed or printed name

 Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal				
Application Number:		12792367		
Filing Date:		02-Jun-2010		
Title of Invention:		PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE		
First Named Inventor/Applicant Name:		Derek RODGER		
Filer:		Gerald T. Shekleton/Richard Sensenbrenner		
Attorney Docket Number:		7836-107560-CIP		
Filed as Large Entity				
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FOREIGN PATENT DOCUMENTS

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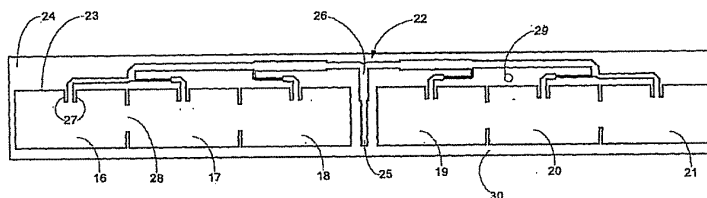


Figure 5

(57) Abstract: A method of forming an antenna by providing a first panel including a first conductive sheet secured to a sheet of dielectric material and forming one or more radiating elements and/or a feed network in the conductive sheet by forming grooves in the conductive sheet. The first panel may be a construction grade building panel or a similar suitable panel. The method enables panel antennas to be manufactured using inexpensive materials using inexpensive manufacturing processes.

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A PANEL ANTENNA AND METHOD OF FORMING A PANEL ANTENNA

FIELD OF THE INVENTION

5 This invention relates to a panel antenna suitable for a wide range of applications including RFID applications and telecommunication applications. The invention also relates to a method of forming a panel antenna and reading RFID tags on conveyors.

10 BACKGROUND OF THE INVENTION

It is known to make patch antennas where the antenna is constructed from multiple pieces, notably where the ground plane and the patch are separately constructed, and are subsequently fixed together, - see for example
15 TW264144B and US2005146479. These antennas have separate feed networks wherever there is more than one antenna in an array, which further increases the number of components that must be assembled to form a functioning antenna system.

20 A technique is known in the art (patent US 2005/0243527) for forming RF feed networks on a printed circuit board (PCB) by etching away unused copper, to leave only the required RF feed networks. These feed networks have not been integrated with antennas on the PCB, instead the antennas are separate items that must be suitably connected to the feed network. These
25 feed networks are designed on the basis of removing most of the copper from the PCB, leaving only that copper required to form the RF feed network.

Separately people have made patch antennas where the radiating patch is made from a PCB or similar. These radiating elements have not been
30 integrated with the feed network, nor with the ground plane, but instead

have been separately constructed and then suitably assembled and connected. These patch antenna radiating elements are designed on the basis of removing most of the copper from the PCB, leaving only that copper required to form the RF radiating element(s).

5

RFID readers for conveyor belts only allow antennas to be placed around the conveyor bed and so RFID tags facing the bed may not be read as the article to which the RFID tag is attached may attenuate the signals too much. This makes RFID tags for conveyors unreliable (unless it can be ensured that all items have a desired orientation) and requires operation at high power levels which can cause interference, require shielding and provide erroneous reads from neighbouring equipment.

10

It would be desirable to provide a panel antenna that is simple and inexpensive to manufacture or to at least provide the public with a useful choice.

15

EXEMPLARY EMBODIMENTS

According to one exemplary embodiment there is provided a method of forming an antenna comprising:

20

providing a first panel including a first conductive sheet secured to a sheet of dielectric material; and

forming one or more radiating elements in the conductive sheet by

25

forming grooves in the conductive sheet.

According to another exemplary embodiment there is provided a panel antenna comprising:

a. a panel formed of dielectric material; and

3

- b. one or more radiating elements formed on a surface of the dielectric material by forming grooves in a first conductive sheet secured to the dielectric material.

5 According to a further exemplary embodiment there is provided a panel antenna comprising:

- a construction grade building panel including a sheet of dielectric material having a conductive sheet secured thereto in which parts of the conductive sheet have been removed to define radiating elements.

10

According to another exemplary embodiment there is provided a method of forming an antenna comprising:

- providing a construction grade building panel including a conductive sheet secured to a sheet of dielectric material; and

15

- forming one or more radiating elements in the conductive sheet by removing portions of the conductive sheet.

According to another exemplary embodiment there is provided a panel antenna for a belt conveyor comprising:

20

- a. a low profile elongate panel antenna having a graduated side profile; and
- b. a friction reducing layer on the surface of the panel antenna which, in use, is located adjacent the conveyor belt.

25

According to another exemplary embodiment there is provided an array of panel antennas for a belt conveyor comprising:

- a. a low profile elongate panel antenna having a graduated side profile;
- b. a friction reducing layer on the surface of the panel antenna which, in use, is located adjacent the conveyor belt;

30

- 5
- c. two low profile elongate panel antennas located on either side of the conveyor belt; and
 - d. a low profile elongate panel antennas located above the conveyor belt with sufficient height to allow objects to pass underneath.

According to another exemplary embodiment there is provided a belt conveyor comprising:

- 10
- a. a bed;
 - b. a belt conveyed upon the bed; and
 - c. a panel antenna located in a recess within the bed such that the panel antenna is located under the belt.

15 According to another exemplary embodiment there is provided a belt conveyor comprising:

- 20
- a. a bed formed of metal having one or more slot formed therein;
 - b. a belt conveyed upon the bed; and
 - c. a panel antenna having one or more radiating element, each radiating element being positioned to radiate using one of the one or more slots.

According to another exemplary embodiment there is provided a method of integrating an antenna into a metal bed of a belt conveyor comprising:

- 25
- a. forming one or more slot in the metal bed; and
 - b. placing a radiating element under each slot so as to form a slot antenna.

BRIEF DESCRIPTION OF THE DRAWINGS

5 The accompanying drawings which are incorporated in and constitute part of the specification, illustrate embodiments of the invention and, together with the general description of the invention given above, and the detailed description of embodiments given below, serve to explain the principles of the invention.

10 **Figure 1** shows a plan view of a patch antenna formed from a composite panel;

Figure 2 shows a side view of the panel shown in figure 1;

15 **Figure 3A** shows a plan view of a monopole antenna formed from a composite panel;

Figure 3B shows a plan view of a dipole antenna formed from a composite panel;

20 **Figure 4A** shows a plan view of a notch antenna formed from a composite panel;

25 **Figure 4B** shows a plan view of a slot antenna formed from a composite panel;

Figure 5 shows a plan view of an array antenna formed from a composite panel;

30 **Figure 6** shows a composite panel being inserted into a metal frame;

Figure 7 shows the panel of figure 6 mounted within a metal frame;

Figure 8 shows the panel of figure 7 with patch radiating elements and a feed network formed therein;

5

Figure 9 shows a feed cable connected to the feed network of the panel antenna shown in figure 8;

10

Figure 10 shows a protective layer being applied to the panel shown in figure 9;

Figure 11 shows the panel antenna of figure 10 with a protective layer applied;

15

Figure 12 shows a manner of inter engaging panels;

Figure 13 shows a phase shifter for use in the feed network of a panel antenna;

20

Figure 14 shows a panel antenna employing a serial feed arrangement;

Figure 15 shows a panel antenna in which the feed network has a branch to feed each radiating element to produce vertically polarised radiation and a branch to feed each radiating element to produce horizontally polarised radiation;

25

Figure 16 shows a panel antenna having radiating elements producing radiation having alternating polarisation;

Figure 17 shows a panel antenna to be deployed under the belt of a conveyor;

Figure 18 shows a panel antenna located in a recess in the bed of a conveyor;

Figure 19 shows a method of creating slot antennas in the bed of a conveyor;

Figure 20 shows the installation of a panel antenna in the bed of a conveyor; and

Figure 21 shows an RFID reading system around a conveyor belt.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Referring to figures 1 and 2 a method of forming a panel antenna according to the first preferred embodiment will be described. A composite panel 1 consisting of a dielectric layer 3 sandwiched between metal sheets 2 and 4 is provided. A groove 5 is formed in panel 1 resulting in the removal of the portions of conductive sheet 2 located along groove 5. This leaves a feed portion 6 and patch antenna 7 defined within groove 5 with the remaining portion 9 of conductive sheet 2 outside of groove 5. Indented portions 8 may be provided for impedance matching. An RF feed line may be operatively coupled to feed line 6 by capacitive coupling or by forming an electrical connection therebetween.

Whilst panel 1 may be formed of a variety of materials the conductive sheets 2 and 4 may preferably be formed of copper, aluminum or stainless steel. The dielectric material 3 may be formed of polyethylene, polypropylene,

PTFE, RT/Duroid 5880, Polystyrene, FR4, ABS (Acrylonitrile butadiene styrene) or similar materials. In a preferred aspect to the invention panel 1 is a mass produced construction grade building panel typically consisting of a polyethylene or polypropylene dielectric sheet 3 sandwiched between
5 copper, aluminum or stainless steel sheets 2 and 4. Such sheets are very inexpensive compared to typical RF materials.

Grooves 5 formed in conductive layer 2 may be formed in a variety of ways including mechanical removal by routing or milling, chemical etching
10 methods etc. This makes manufacture of the antennas very inexpensive utilizing commonly available equipment. The resulting product also has a very low profile.

Figure 3A shows a monopole antenna formed by forming groove 13 in
15 conductive sheet 2. The ground plane for the monopole has not been shown.

Figure 3B shows an alternative embodiment in which a dipole antenna and feed paths is formed in conductive sheet 2 by forming grooves 11 and 12.

Figure 4A shows a notch antenna formed by forming groove 15 in
20 conductive sheet 2.

Figure 4B shows a slot antenna formed by forming groove 14 in conductive
25 sheet 2.

Referring now to figure 5 an antenna array consisting of patch antennas 16 to 21 fed by a feed network 22 is defined by forming grooves 23 in conductive sheet 24. As in the previous example conductive sheet 24 is secured to a dielectric layer below. Preferably a ground plane conductive sheet is
30 secured to the base of the dielectric layer (as per conductive sheet 4 in figure

2). Feed point 25 is driven by an RF signal source and divider 26 divides the power into two branches. The widths of the conductors in the feed network are dimensioned so as to provide an appropriate power division between patch antennas, and to provide appropriate impedances. Indents, such as
5 indent 27 in patch 16, are provided to provide impedance matching. Patches are partially conjoined by conductive material, such as indicated at 28, between patches to enhance balancing. This assists in providing equal power division and partial separation between the patches prevents standing waves forming. Various layouts may be used as will be apparent to one
10 skilled in the field including both transmit and receive antenna arrays and feed networks on a single panel.

To avoid inactive portions of conductive sheet 24 (i.e. those portions of conductive sheet 24 not being patches 16-21 or feed network 22) having
15 undesired effects they may be electrically connected to the ground plane. The edges 30 may be connected by conductive elements wrapping around from the top to the bottom of the panel whereas through electrical connections, such as rivets etc. 29 may extend through the panel to provide a conductive path between the ground plane and those parts of conductive
20 sheet 24. Alternatively the inactive portions may be removed (for example by routing or milling). The antenna shown in figure 5 may advantageously be formed from a construction grade building panel. Such a panel may have copper or aluminum sheets affixed to a dielectric layer of polyethylene or polypropylene. The dielectric material may have a thickness greater than
25 3mm, preferably greater than 4mm and more preferably about 6mm.

Referring now to figures 6 to 12 a preferred method for forming and assembling panel antennas as for RFID timing applications is disclosed. A construction grade building panel 31 having a dielectric layer 33 sandwiched
30 between conductive layers 32 and 34 has a metal frame 35 folded around it

into the position shown in figure 7. The metal frame 35 provides mechanical rigidity and reduces undesired effects caused by inactive portions of the conductive sheet. It will be noted that one end 36 of panel 31 extends beyond frame 35 and at the other end a gap 37 is left. A groove 38 is then
5 mechanically formed in panel 31 by routing, milling etc. to form a feed network 39 and patch elements 40 and 41 as shown in figure 8. The groove 38 may optionally be formed prior to the metal frame 35 is folded around panel 31. A feed cable 42 is then connected so that the signal line 43 is capacitively coupled or electrically connected to feed network 39 and the
10 outer conductor is connected to conductive sheet 34. A weatherproof layer 44 is then applied over panel 31 to form a completed unit as shown in figure 11 and to reduce environmental tuning/detuning effects. A number of such units may be interconnected as shown in figure 12 so that the protruding tongue 36 engages in slot 37 to mechanically secure the panels together.
15 Other fastening techniques may also be used, such as gluing, or using hook and loop fasteners. Any number of like panels may be connected together in this manner to define a continuous panel antenna that may be placed across a start - finish line for RFID timing applications. In such applications the panel antennas may illuminate the start - finish line to activate RFID tags as
20 they cross it.

The feed cable 42 may also be connected from the rear of the panel 31. This arrangement allows the feed point to be positioned away from the edge of the panel 31. In this arrangement the central conductor of the feed cable 42
25 passes through a hole in the lower conductive layer 4 and the dielectric 3, and is electrically connected to feed network 39 and the outer conductor is connected to the lower conductive sheet 4. The feed cable 42 may also be replaced by a suitably sized connector, where the central pin of the connector passes through a hole in the lower conductive layer 4 and the

dielectric 3, and is electrically connected to feed network 39 and the shield or frame of the connector is connected to the lower conductive sheet 4.

Referring now to figure 13 a phase shifter arrangement suitable for use with the panel antenna shown in figure 5 is shown. Two tracks 46 and 47 of a feed network are provided on panel 45 including the feed network and radiating elements (i.e. An arrangement such as show in figure 5 simplified to show only a section of the feed network to have a phase shifter inserted). On a separate panel 49 a conductive portion 48 is provided. Conductive portion 48 is placed over tracks 46 and 47 in use so that movement to the right or left relative to panel 45 causes the path length via track 48 to change. This enables a "trombone" type phase shifter to be incorporated into the feed network as shown in figure 5. For an array any number of such "trombone" elements 48 may be provided on a single panel 49 and aligned with the main panel 45 so as to enable variable phase shifts to be introduced at various points in the feed network. This may be particularly suitable in telecommunication applications for effecting beam tilt or adjusting beam width. Both panels 45 and 49 may be construction grade building panels although in this case the conductive material surrounding tracks 46 to 48 should be removed to enable proper operation of the phase shifter. Alternatively, the tracks 46 and 47 could be located at the edge of the panel 45. A phase shifter may also be formed by constructing the trombone 48 of a dielectric material, and by connecting conductive tracks 46 and 47.

Referring now to figure 14 a panel antenna 50 having a serial feed network is shown. Patch 51 is fed by feed 54 and feeds patch 52 via feed 55, which in turn feeds patch 53 via feed 56. The feed to each successive patch is progressively advanced towards the center of each patch so that the effective impedance of the feed to each patch decreases along the series of patches. It will be seen that the recesses 57 are smaller than recesses 59 which in turn

are smaller than recesses 61. Recesses 58 and 59 and recesses 60 and 61 are the same to achieve matching. This arrangement provides equal power distribution to each patch using a simple serial feed arrangement. Instead of varying impedance in this manner the impedance could be varied by using
5 stubs to vary inductance and by varying the geometry of a ground plane to vary capacitance. The inductive and capacitive components could be tuned to the resonant frequency of the antenna.

Figure 15 shows a panel antenna in which radiating elements may be driven
10 with orthogonally polarised radiation. A first branch of the feed network 66 feeds patches 62 to 65 to produce vertically polarised radiation and a second branch of the feed network 67 feeds patches 62 to 65 so as to produce horizontally polarised radiation. In use one branch 66 or 67 may be driven to produce radiation having one polarization, both may be driven to produce
15 circular polarization or the branches may be alternately driven. Operation may be determined by hard wiring at installation or by driving logic driving the respective branches. Alternative polarizations can also be achieved with different routing geometries, for example the patches could be oriented at 45 degrees to achieve diagonal polarisation.

20 Figure 16 shows a panel antenna in which a first branch of the feed network 72 feeds patches 68 and 70 so as to produce vertically polarised radiation and a second branch of the feed network 73 drives patches 69 and 71 so as to produce horizontally polarised radiation.

25 Whilst the panel antennas shown in figures 14 to 16 may be used in a wide range of applications they are suitable for use in RFID applications including monitoring items on conveyors.

Figure 17 shows a panel antenna adapted to be placed under the belt of a conveyor belt to enable the reading of RFID tags. Body 74 has ramped portions 75 and 76 to provide a gradual transition as the belt passes over the panel antenna. A recess 77 is provided to accommodate panel antenna 78 (which could be any of the panel antennas as shown in figures 14 to 16). Body 74 is preferably formed of a material having a low friction coefficient and panel antenna 78 is preferably coated with a material having a low friction coefficient which is relatively transparent to ultra high radio frequency radiation, such as Ultra-High Molecular Weight Polyethylene (UHMWPE).

A panel antenna of the type shown in figure 17 may simply be placed between the bed of a belt conveyor and the conveyor belt so that it may be easily retrofitted to existing conveyor belts. The total thickness of the assembly is preferably less than 15 mm, and more preferably less than 10 mm. By providing a panel antenna underneath the belt as well as antennas surrounding the belt reliable reading of RFID tags may be achieved. Using this technique reliable RFID readers may be easily retrofitted to existing conveyor belts.

Figure 18 shows a conveyor in which a panel antenna 82 is located within a recess 81 of conveyor bed 80. The panel antenna 82 is preferably coated with the material having a low friction coefficient which is relatively transparent to ultra high radio frequency radiation, such as Ultra-High Molecular Weight Polyethylene (UHMWPE). This arrangement allows the conveyor belt to move over the conveyor bed without any disruption to its path.

Figure 19 shows the underside of a conveyor bed according to another embodiment. This design may be used when constructing a new conveyor

bed or to retrofit an existing conveyor bed. A plurality of slots 84 are formed in the sheet metal base of bed 83. Radiating elements 85 are located on the underside of the conveyor bed proximate the slots. Radiating elements 85 may be in the form of a panel antenna or individual elements. The slots may
5 be filled with a dielectric material.

Figure 20 shows an embodiment in which a panel antenna 87 is provided as a bridge between two conveyor belts 86 and 88. In this way an RFID tag can be read at the point one conveyor transfers its items to another conveyor.

10 Figure 21 shows a conveyor 89 including a lower panel antenna 90 (of the form shown in figure 17), side panel antennas 91 and 92 and a top panel antenna 93. Panel antennas 91, 92 and 93 are suspended by wires 94 so that if an item on the conveyor hits a panel antenna it can simply sway out of the
15 way.

Such an arrangement allows RFID tags being conveyed to be read from all directions, reducing the required power of transmitted radiation and greatly improving read reliability. Reduced power reduces interference with
20 neighbouring systems and misreads from nearby readers.

It will be appreciated that panel antennas could be fixedly secured to surround a conveyor belt or be provided within an X-ray machine etc.

25 The panel antennas are preferably operated in the ultra high frequency range and have been effectively deployed operating at 920 to 926 MHz. The antennas should preferably be driven so as to avoid opposing antennas being on at the same time and to avoid nulls. The drive strategy employed should provide good coverage of all possible tag positions and tag orientations. This

may include switching the panel antennas being driven or scanning the read space with the antenna beam.

5 The method of manufacture described allows antennas to be constructed from inexpensive panels, such as are produced for the building industry using inexpensive manufacturing techniques. By simultaneously forming the radiating elements and feed network in one manufacturing step production is simplified and labour costs are reduced. Panels produced are robust, rigid,
10 have a low profile and can easily be incorporated into building structures. Series of panels can be joined together end to end to provide a long panel suitable for timing applications.

Conveyor belts incorporating a panel antenna to read from underneath the
15 belt provide accurate RFID tag reading in all directions and allow the RFID reader to operate at lower power levels without requiring shielding.

While the present invention has been illustrated by the description of the embodiments thereof, and while the embodiments have been described in
20 detail, it is not the intention of the Applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative apparatus and method, and illustrative examples shown and
25 described. Accordingly, departures may be made from such details without departure from the spirit or scope of the Applicant's general inventive concept.

CLAIMS

1. A method of forming an antenna comprising:
 - a. providing a first panel including a first conductive sheet
5 secured to a sheet of dielectric material; and
 - b. forming one or more radiating elements in the conductive sheet by forming grooves in the conductive sheet.
2. A method as claimed in claim 1 wherein a feed network feeding the
10 one or more radiating elements is also formed by forming grooves in the first conductive sheet.
3. A method as claimed in claim 2 wherein the antenna includes an
15 array of radiating elements and the feed network is formed to feed the radiating elements in series with the effective impedance of the feed to each radiating element decreasing towards the end of the array.
4. A method as claimed in claim 2 wherein one branch of the feed
20 network is formed to feed the one or more radiating elements so as to produce radiation having a first polarization and a second branch of the feed network is formed to feed the one or more radiating elements so as to produce radiation having a second polarization substantially orthogonal to the first polarization.
- 25 5. A method as claimed in claim 4 wherein the first polarisation is horizontal and the second polarization is vertical.
6. A method as claimed in claim 2 wherein one branch of the feed
30 network is formed to feed one or more radiating elements so as to produce radiation having a first polarization and a second branch of

the feed network is formed to feed the other radiating elements so as to produce radiation having a second polarization substantially orthogonal to the first polarization.

- 5 7. A method as claimed in claim 6 wherein the first polarisation is horizontal and the second polarization is vertical.
8. A method as claimed in claim 6 or claim 7 wherein each branch of the feed network feeds two elements.
- 10 9. A method as claimed in claim 3 wherein the inductive impedance of the feed to each radiating element is adjusted using one or more stub.
- 15 10. A method as claimed in claim 3 or 9 wherein the capacitive impedance of the feed to each radiating element is adjusted by varying the geometry of a ground plane.
- 20 11. A method as claimed in claim 2 wherein feeds to at least one of the one or more radiating elements are formed by grooves extending within the perimeter of the radiating element to provide impedance matching.
- 25 12. A method as claimed in claim 11 wherein the feed network is formed to feed the radiating elements in series with each successive feed to a subsequent radiating elements being formed by grooves extending further within the perimeter of the subsequent radiating element than for the preceding radiating element.

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13. A method as claimed in any preceding claim wherein the feed network includes coupling elements configured to form variable phase shifters in conjunction with complementary coupling elements.
- 5 14. A method as claimed in claim 13 wherein the complementary coupling elements are formed by forming grooves in a conductive sheet of a second panel.
- 10 15. A method as claimed in claim 14 wherein the coupling elements are arranged face to face such that relative movement of the first and second panels changes the effective feed path length to radiating elements of the feed network.
- 15 16. A method as claimed in any preceding claim wherein the feed network includes coupling elements configured to form variable phase shifters in conjunction with complementary dielectric elements.
- 20 17. A method as claimed in any preceding claim wherein the grooves are formed by mechanically removing conductive material.
- 25 18. A method as claimed in claim 17 wherein the conductive material is removed by routing or milling.
19. A method as claimed in any one of the preceding claims wherein each radiating element is a patch antenna.
20. A method as claimed in any one of claims 1 to 19 wherein each radiating element is a dipole antenna.

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21. A method as claimed in any one of claims 1 to 19 wherein each radiating element is a notch antenna.
22. A method as claimed in any one of claims 1 to 19 wherein each
5 radiating element is a slot antenna.
23. A method as claimed in any one of claims 1 to 19 wherein each radiating element is a monopole antenna.
- 10 24. A method as claimed in any one of claims 1 to 19 wherein a plurality of radiating elements are provided as an array antenna.
25. A method as claimed in claim 24 wherein a plurality of patch
15 antennas are provided side by side in an array with adjacent patch antennas being partially conjoined by conductive material of the first conductive sheet.
26. A method as claimed in any preceding claim wherein the first panel
20 includes first and second conductive sheets having the dielectric material sandwiched therebetween.
27. A method as claimed in claim 26 wherein one or more radiating
25 element is a patch antenna and a signal terminal of a signal coupling is connected to an input to the feed network provided on the first conductive sheet and a ground terminal of the signal coupling is connected to the second conductive sheet.
28. A method as claimed in claim 26 or claim 27 wherein one or more conductive portions of the first conductive sheet not being part of the

feed network or radiating elements are electrically connected to the second conductive sheet.

- 5 29. A method as claimed in any one of the preceding claims wherein the first panel is surrounded by a metal sheet facing the second conductive sheet and at least partially wrapping around edges of the first panel.
- 10 30. A method as claimed in any one of the preceding claims wherein the first panel is a construction grade building panel.
- 15 31. A panel antenna comprising:
a. a panel formed of dielectric material; and
b. one or more radiating elements formed on a surface of the dielectric material by forming grooves in a first conductive sheet secured to the dielectric material.
- 20 32. A panel antenna as claimed in claim 31 including a feed network feeding the one or more radiating elements formed by forming grooves in the first conductive sheet.
- 25 33. A panel antenna as claimed in claim 32 wherein the antenna includes an array of radiating elements and the feed network feeds the radiating elements in series with the effective impedance of the feed to each radiating element decreasing towards the end of the array.
- 30 34. A panel antenna as claimed in claim 32 wherein one branch of the feed network feeds the one or more radiating elements so as to produce radiation having a first polarization and a second branch of the feed network feeds the one or more radiating elements so as to

produce radiation having a second polarization substantially orthogonal to the first polarization.

- 5 35. A panel antenna as claimed in claim 34 wherein the first polarisation is horizontal and the second polarization is vertical.
- 10 36. A panel antenna as claimed in claim 32 wherein one branch of the feed network feeds one or more radiating elements so as to produce radiation having a first polarization and a second branch of the feed network feeds the other radiating elements so as to produce radiation having a second polarization substantially orthogonal to the first polarization.
- 15 37. A panel antenna as claimed in claim 36 wherein the first polarisation is horizontal and the second polarization is vertical.
38. A panel antenna as claimed in claim 36 or claim 37 wherein each branch of the feed network feeds two elements.
- 20 39. A panel antenna as claimed in claim 31 wherein feeds to at least one of the one or more radiating elements are formed by grooves extending within the perimeter of each radiating element to provide impedance matching.
- 25 40. A panel antenna as claimed in claim 39 wherein the radiating elements are fed in series with each successive feed to a subsequent radiating element being formed by grooves extending further within the perimeter of the subsequent radiating element than for the preceding radiating element.
- 30

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41. A panel antenna as claimed in any one of claims 32 to 40 wherein the feed network includes coupling elements configured to form variable phase shifters in conjunction with complementary coupling elements.
- 5 42. A panel antenna as claimed in claim 41 wherein the complementary coupling elements are formed by forming grooves in a conductive sheet of a second panel.
- 10 43. A panel antenna as claimed in claim 42 wherein the coupling elements are arranged face to face such that relative movement of the first and second panels changes the effective feed path length to radiating elements of the feed network.
- 15 44. A panel antenna as claimed in any one of claims 32 to 43 wherein the feed network includes coupling elements configured to form variable phase shifters in conjunction with complementary dielectric elements.
- 20 45. A panel antenna as claimed in any one of claims 32 to 43 wherein one or more radiating element is a patch antenna.
- 25 46. A panel antenna as claimed in any one of claims 32 to 43 wherein one or more radiating element is a dipole antenna.
47. A panel antenna as claimed in any one of claims 32 to 43 wherein one or more radiating element is a notch antenna.
48. A panel antenna as claimed in any one of claims 32 to 43 wherein one or more radiating element is a slot antenna.

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49. A panel antenna as claimed in any one of claims 32 to 48 wherein a plurality of radiating elements are provided as an array antenna.
50. A panel antenna as claimed in claim 49 wherein a plurality of patch
5 antennas are provided side by side in an array with adjacent patch antennas being partially conjoined by conductive material of the first conductive sheet.
51. A panel antenna as claimed in any one of claims 32 to 50 wherein the
10 first panel includes first and second conductive sheets having the dielectric material sandwiched therebetween.
52. A panel antenna as claimed in claim 51 wherein one or more
15 radiating element is a patch antenna and a signal terminal of a signal coupling is connected to an input to the feed network provided on the first conductive sheet and a ground terminal of the signal coupling is connected to the second conductive sheet.
53. A panel antenna as claimed in claim 51 or claim 52 wherein one or
20 more conductive portions of the first conductive sheet not being part of the feed network or radiating elements are electrically connected to the second conductive sheet.
54. A panel antenna as claimed in any one of claims 32 to 53 wherein the
25 first panel is surrounded by a metal sheet facing the second conductive sheet and at least partially wrapping around edges of the first panel.
55. A panel antenna as claimed in any one of claims 32 to 54 wherein the
30 first panel is a construction grade building panel.

56. A panel antenna as claimed in any one of claims 32 to 55 wherein the dielectric material is selected from: polyethylene, polypropylene, PTFE, a fiberglass epoxy resin composite, Polystyrene and Acrylonitrile butadiene styrene.
57. A panel antenna as claimed in any one of claims 32 to 56 wherein the dielectric material has a thickness greater than 3 mm.
58. A panel antenna as claimed in any one of claims 32 to 57 wherein the dielectric material has a thickness greater than 4 mm.
59. A panel antenna as claimed in any one of claims 32 to 56 wherein the dielectric material has a thickness of about 6 mm.
60. A panel antenna as claimed in any one of claims 32 to 59 wherein the first conductive sheet is copper.
61. A panel antenna as claimed in any one of claims 32 to 59 wherein the first conductive sheet is Aluminium.
62. A panel antenna comprising:
A construction grade building panel including a sheet of dielectric material having a conductive sheet secured thereto in which parts of the conductive sheet have been removed to define radiating elements.
63. A method of forming an antenna comprising:
providing a construction grade building panel including a conductive sheet secured to a sheet of dielectric material; and

forming one or more radiating elements in the conductive sheet by removing portions of the conductive sheet.

- 5 64. A panel antenna as claimed in any one of claims 32 to 43 wherein one or more radiating element is a monopole antenna.
65. A panel antenna for a belt conveyor comprising:
- 10 a. a low profile elongate panel antenna having a graduated side profile; and
- b. a friction reducing layer on the surface of the panel antenna which, in use, is located adjacent the conveyor belt.
66. A panel antenna as claimed in claim 65 wherein the friction reducing layer has a low level of attenuation of radio signals in the ultra high frequency range.
- 15 67. A panel antenna as claimed in claim 65 or 66 wherein the friction reducing layer is Ultra-High Molecular Weight Polyethylene (UHMWPE).
- 20 68. A panel antenna as claimed in any one of claims 65 to 67 wherein the panel antenna is less than 15mm thick.
- 25 69. A panel antenna as claimed in any one of claims 65 to 68 wherein the panel antenna is less than 10mm thick.
70. A belt conveyor comprising:
- a. a bed;
- b. a belt conveyed upon the bed; and

- c. a panel antenna located in a recess within the bed such that the panel antenna is located under the belt.

- 5 71. A belt conveyor as claimed in claim 70 wherein the panel antenna has a friction reducing layer on the side facing the belt.
72. A belt conveyor as claimed in claim 71 wherein the friction reducing layer is Ultra-High Molecular Weight Polyethylene (UHMWPE).
- 10 73. A belt conveyor as claimed in any one of claims 70 to 72 including additional panel antennas extending around the belt.
74. A belt conveyor as claimed in claim 73 wherein the additional panel antennas consist of two side antennas and a top antenna.
- 15 75. A belt conveyor as claimed in claim 73 or 74 wherein the additional antennas are flexibly suspended above the belt.
76. A belt conveyor comprising:
- 20 a. a bed formed of metal having one or more slot formed therein;
- b. a belt conveyed upon the bed; and
- c. one or more radiating element, each radiating element being positioned to radiate using one of the one or more slots.
- 25 77. A belt conveyor as claimed in claim 76 wherein a plurality of slots are formed in the bed.
78. A belt conveyor as claimed in claim 76 or claim 77 including additional panel antennas extending around the belt.
- 30

79. A belt conveyor as claimed in claim 78 wherein the additional panel antennas consist of two side antennas and a top antenna.
- 5 80. A belt conveyor as claimed in claim 78 or 79 wherein the additional antennas are flexibly suspended above the belt.
81. A method of integrating an antenna into a metal bed of a belt conveyor comprising:
- 10 a. forming one or more slot in the metal bed; and
- b. placing a radiating element under each slot so as to form a slot antenna.
82. A panel antenna as claimed in any one of claims 31 to 69 configured to operate in the ultra high frequency band.

15

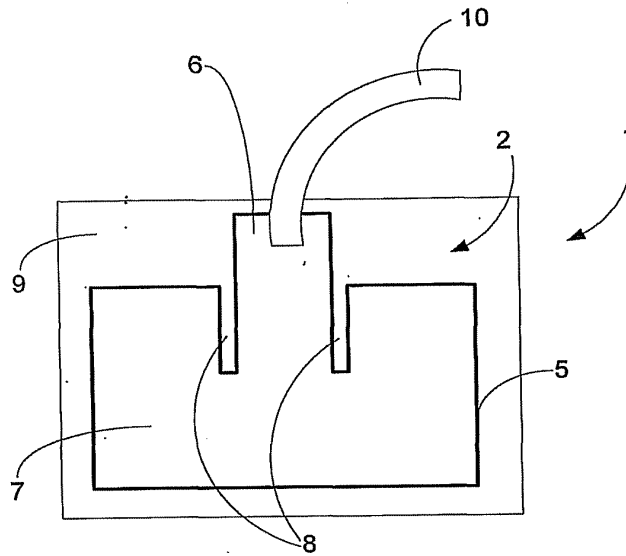


Figure 1

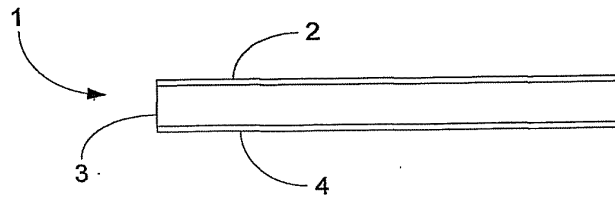


Figure 2

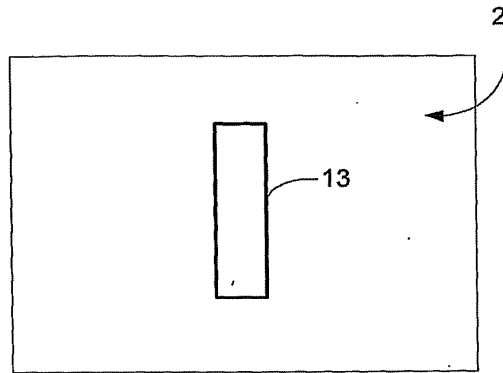


Figure 3A

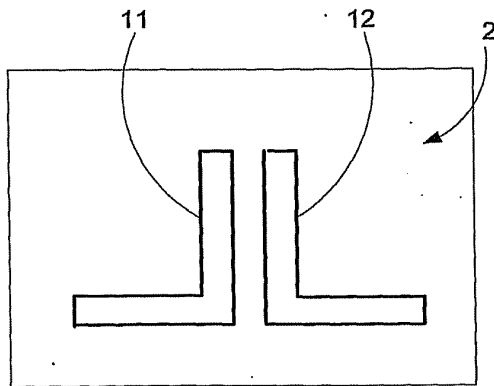


Figure 3B

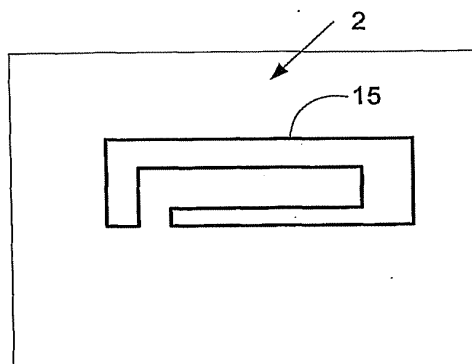


Figure 4A

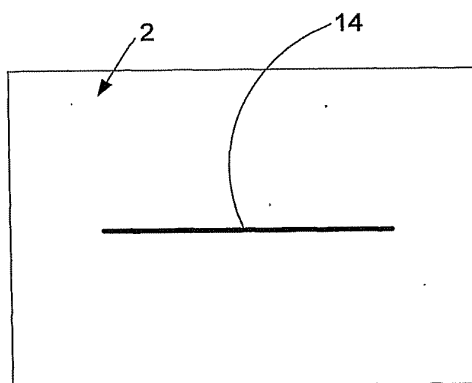


Figure 4B

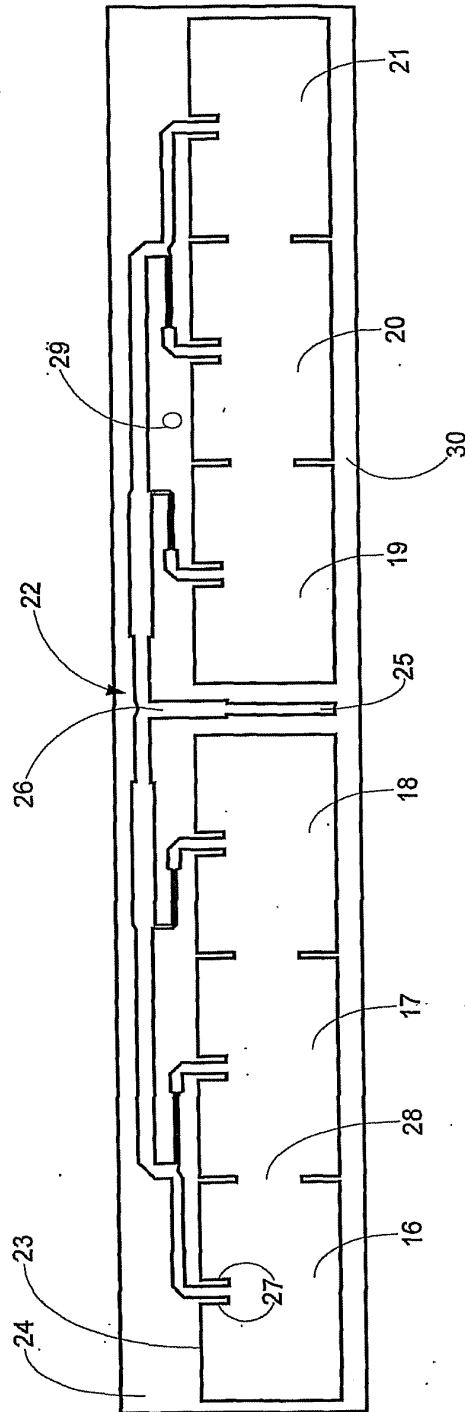


Figure 5

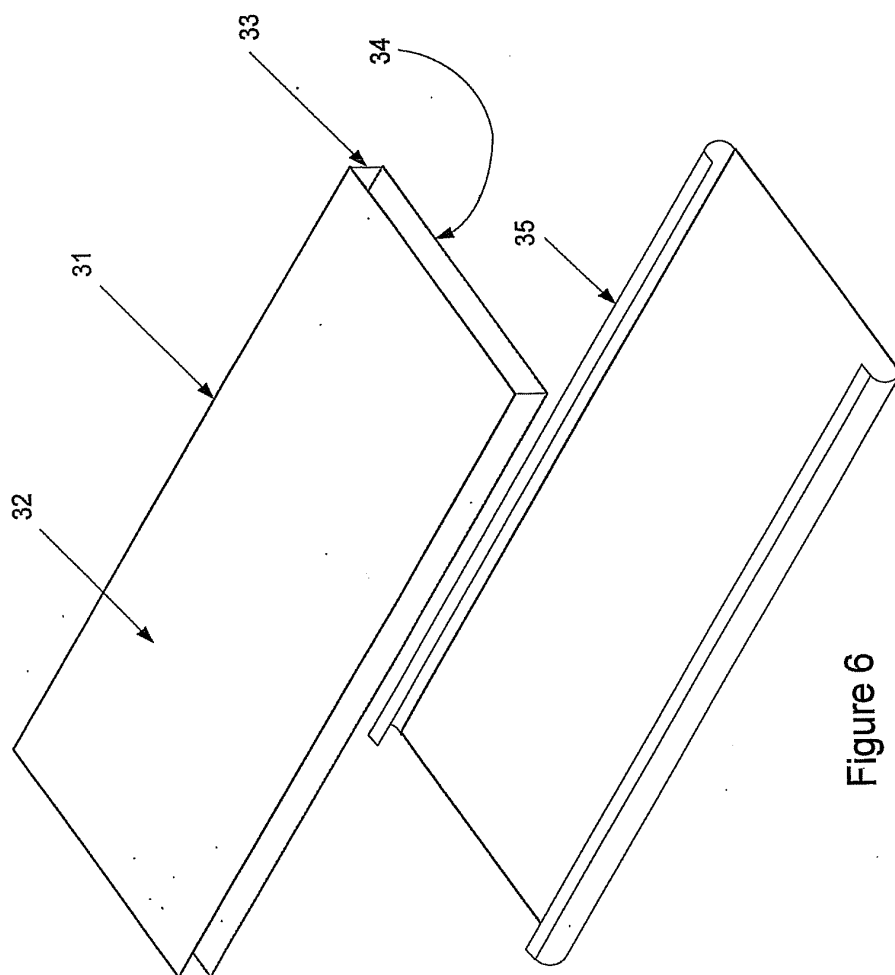


Figure 6

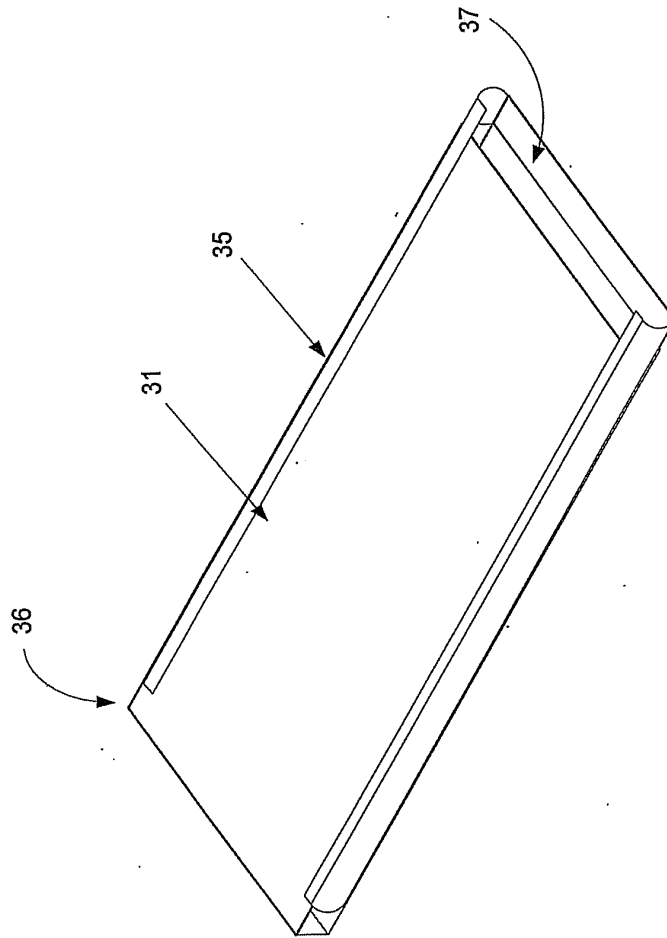


Figure 7

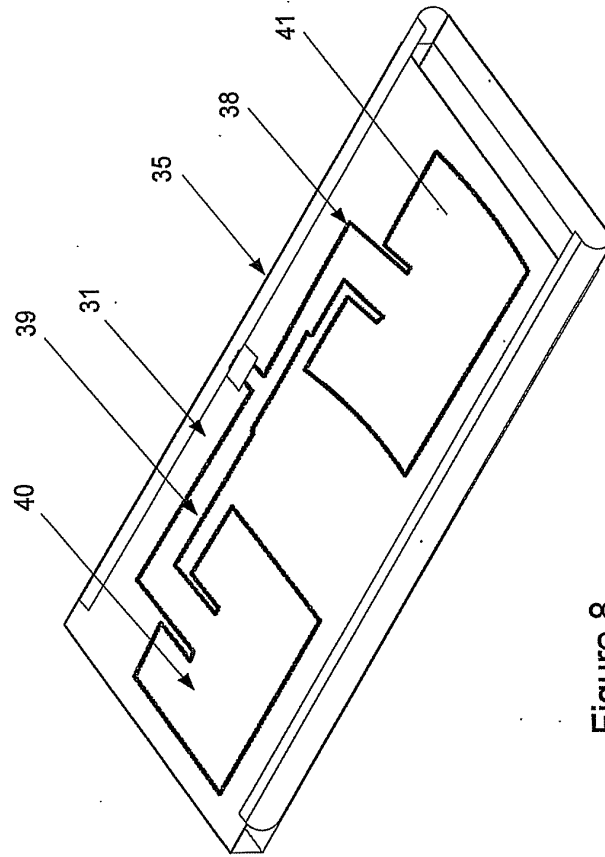


Figure 8

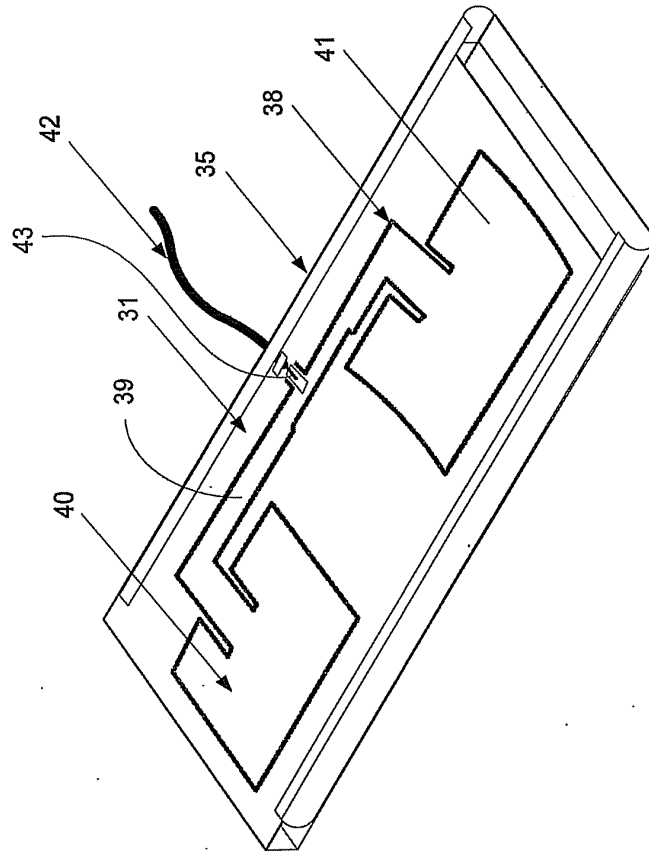


Figure 9

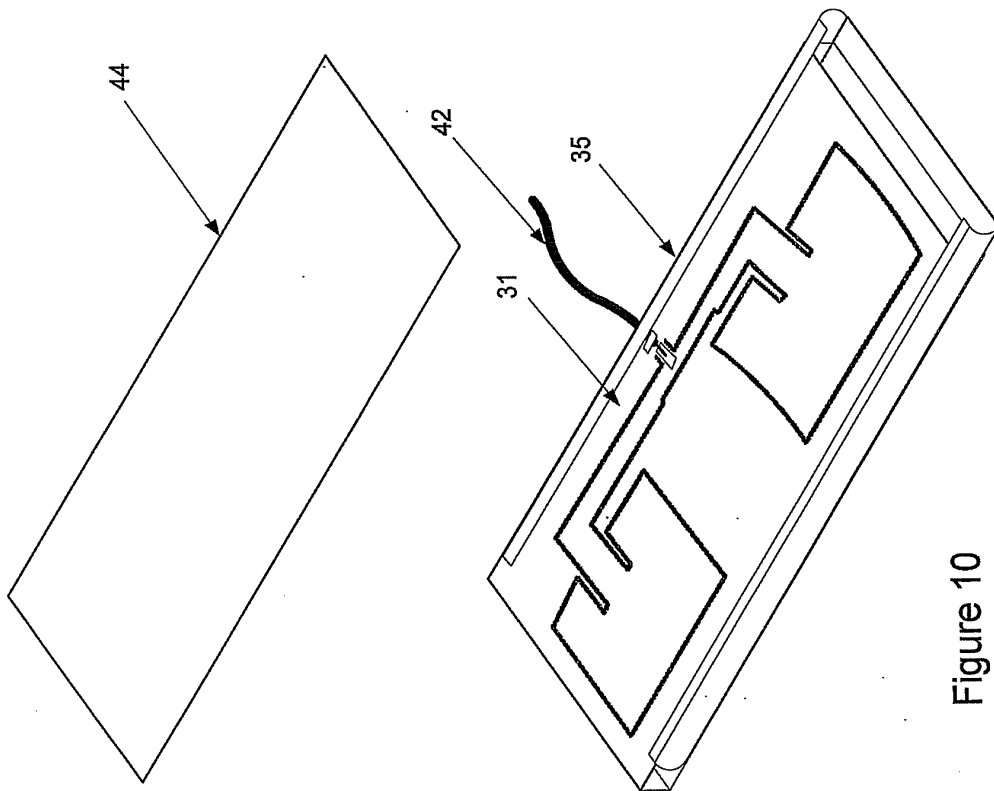


Figure 10

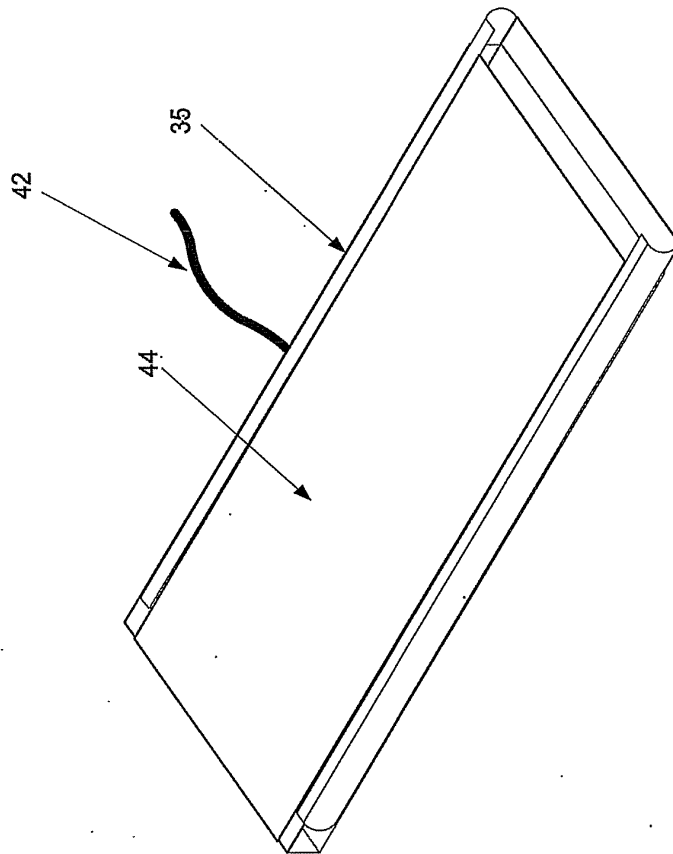


Figure 11

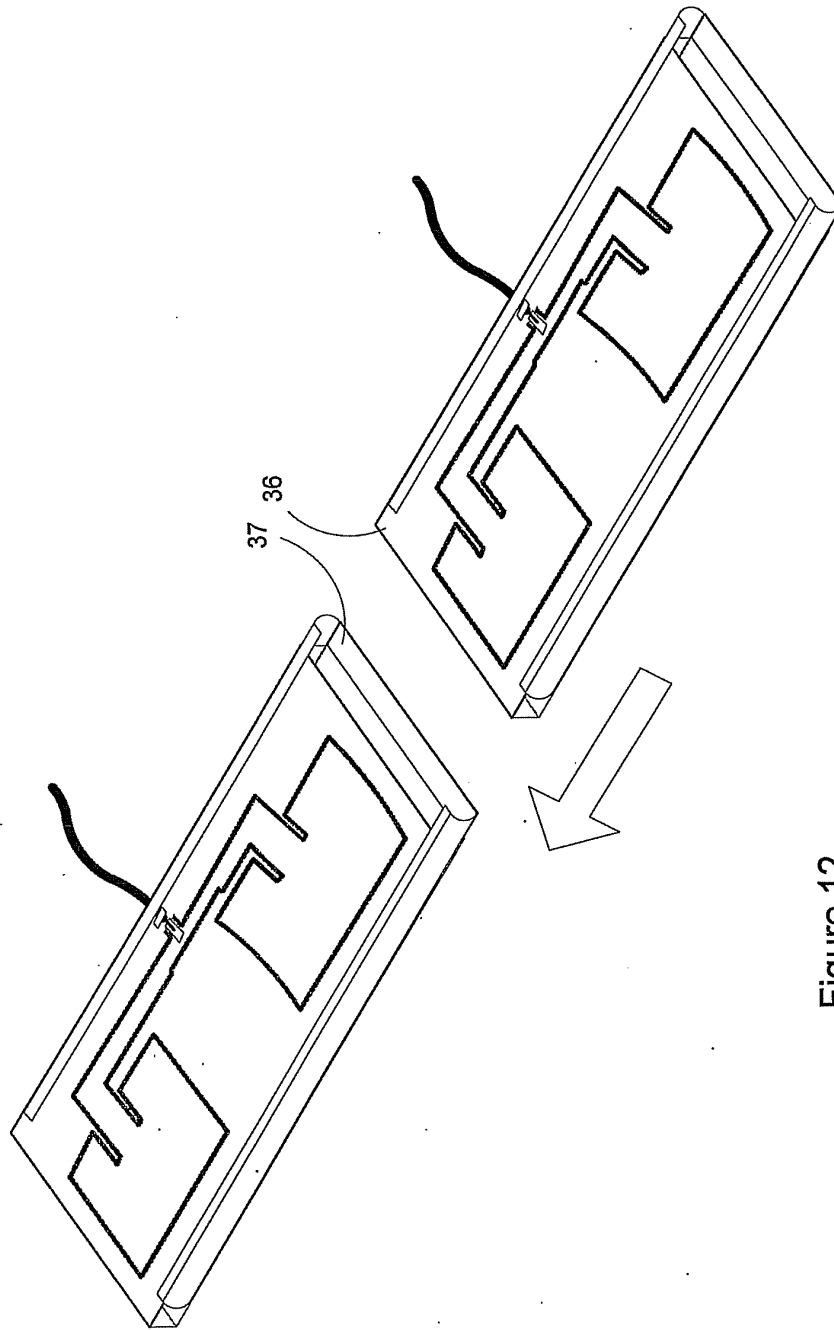


Figure 12

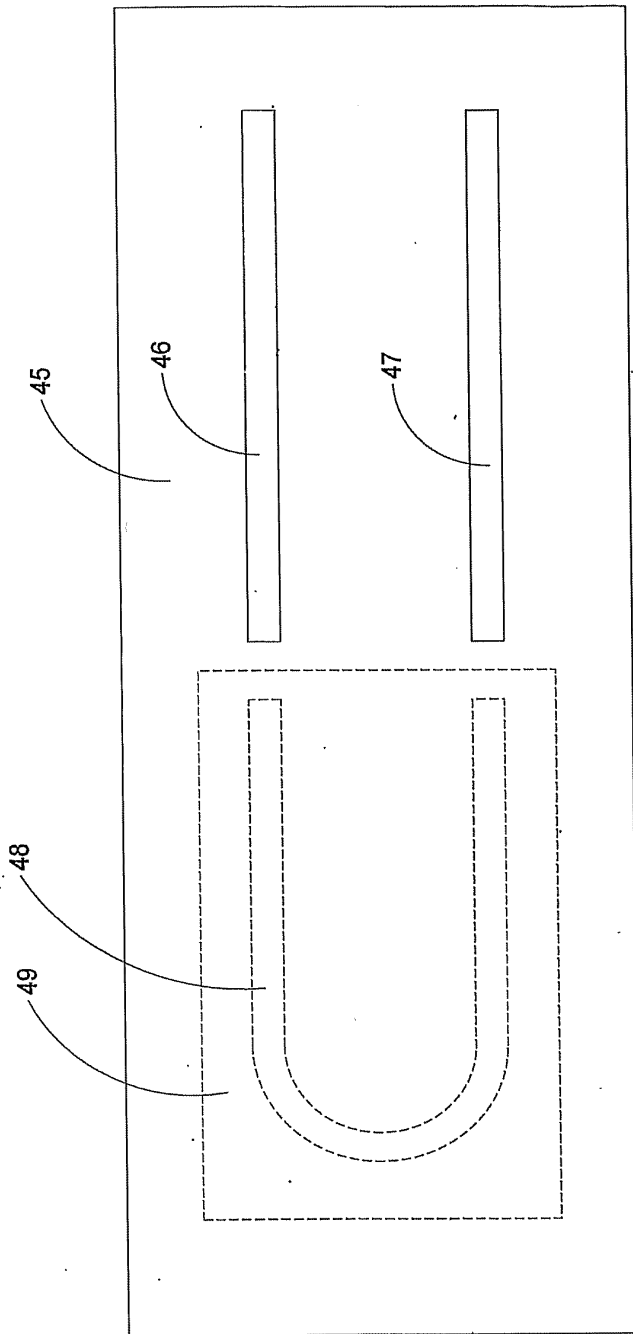


Figure 13

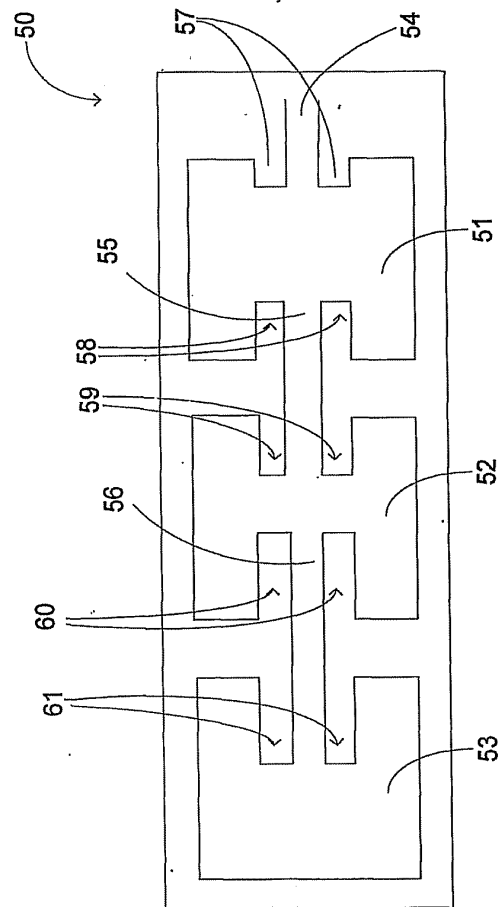


Figure 14

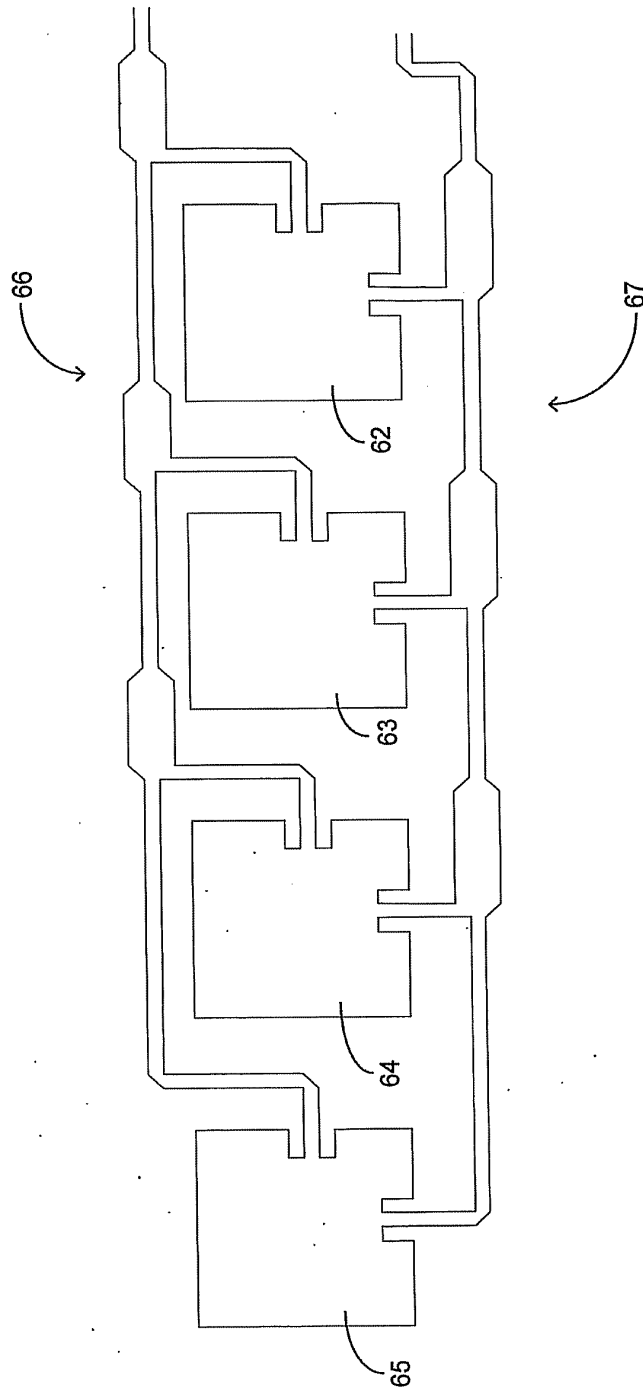


Figure 15

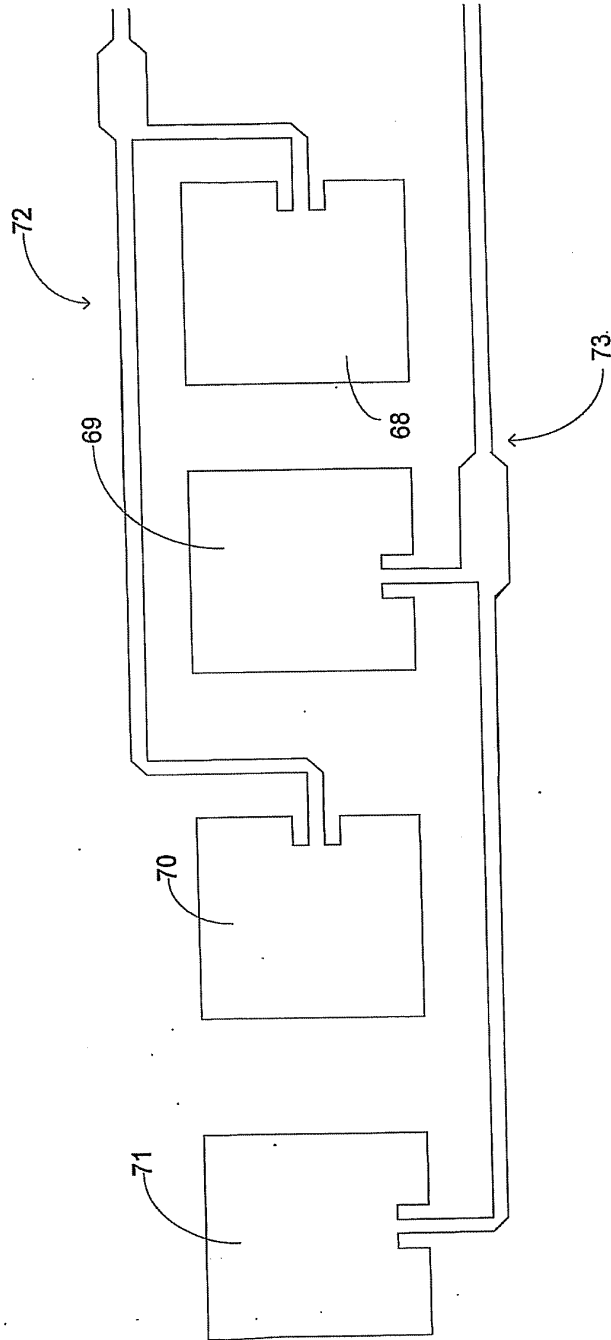


Figure 16

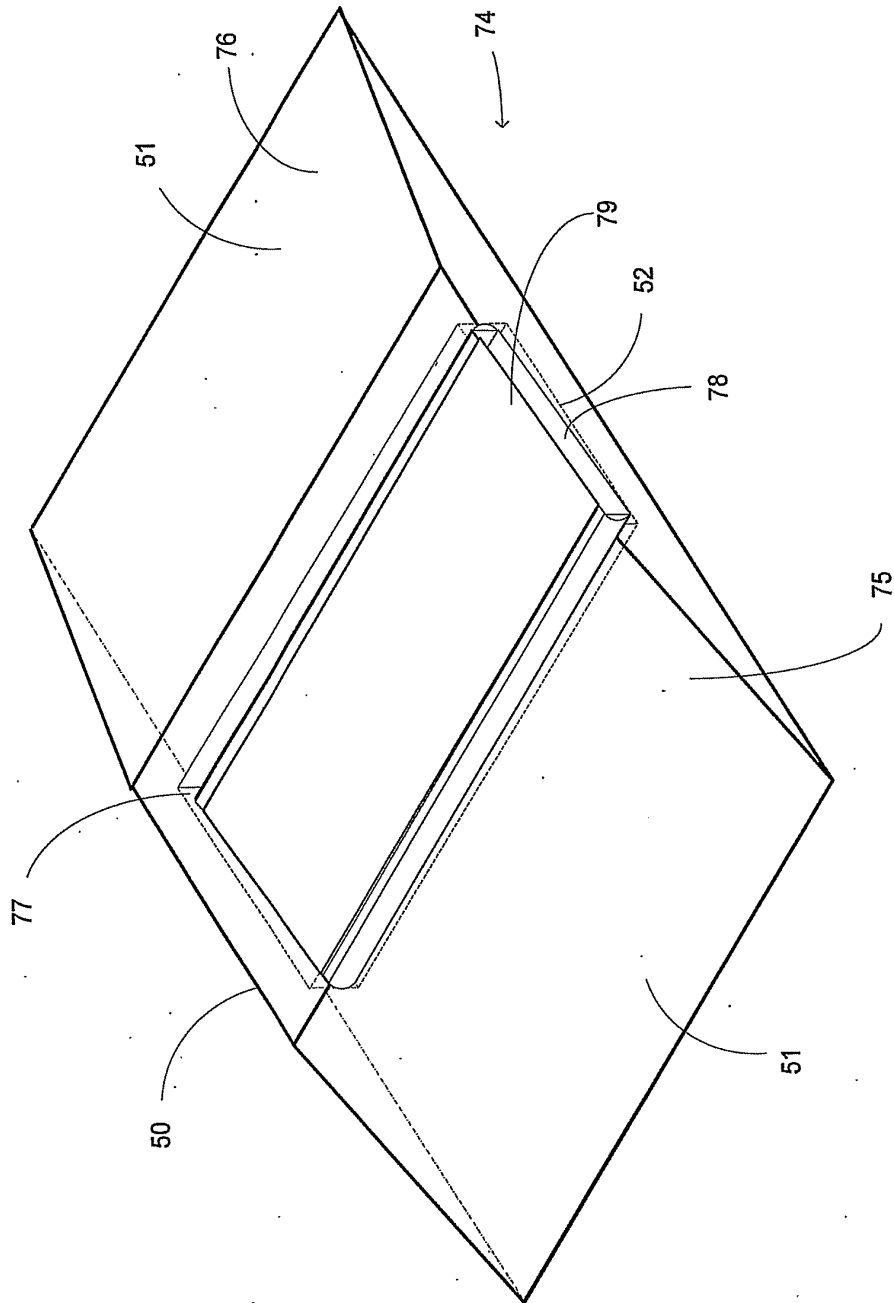


Figure 17

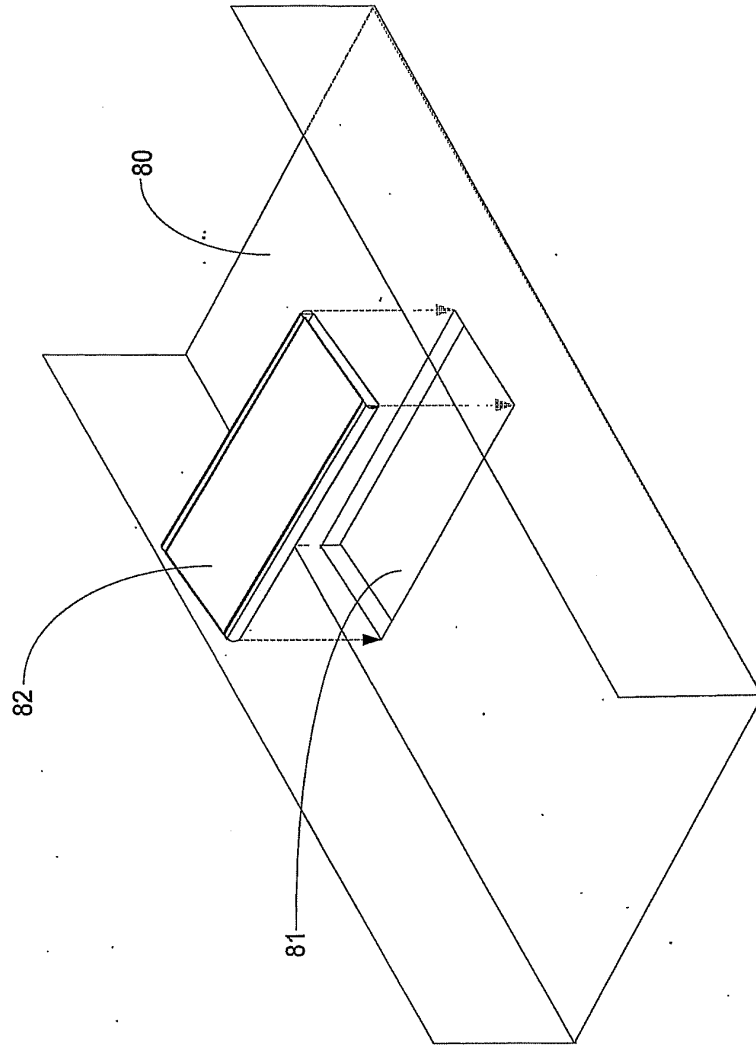


Figure 18

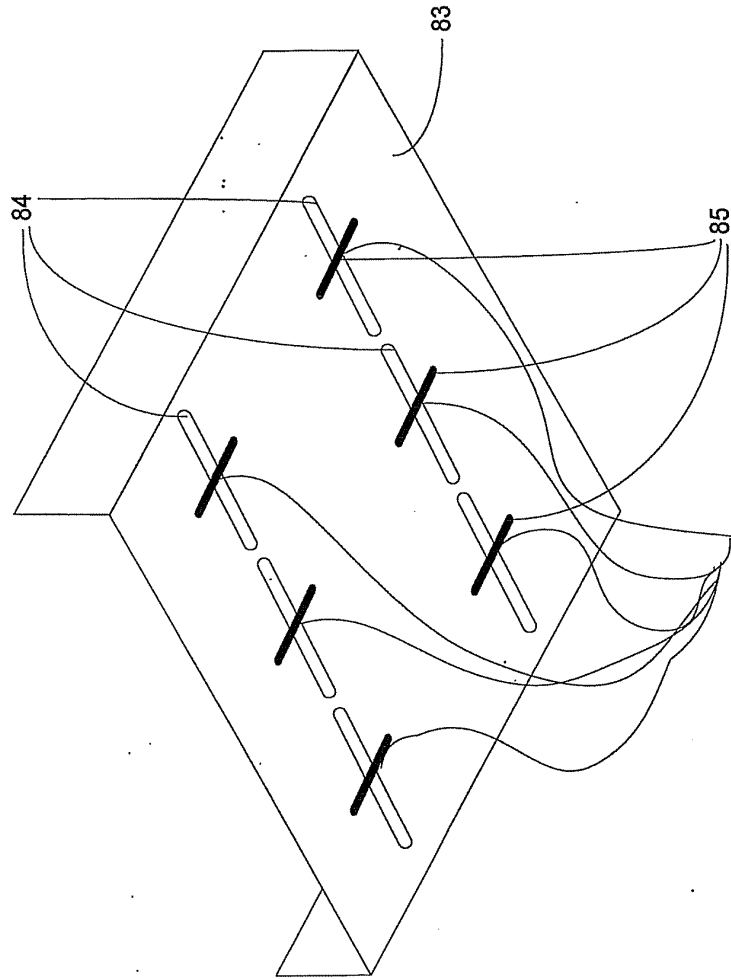


Figure 19

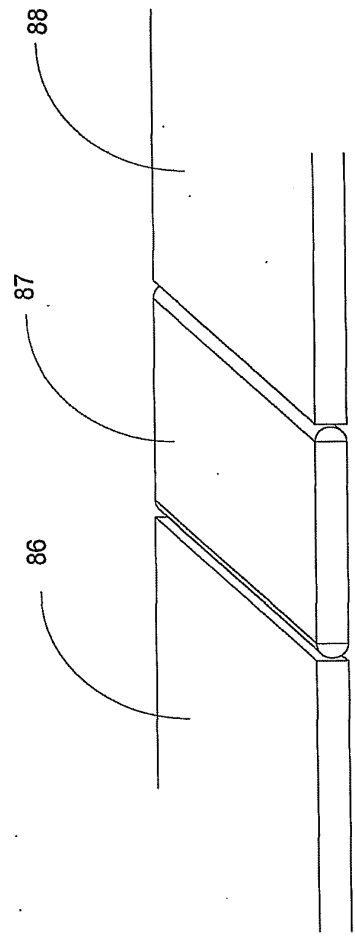


Figure 20

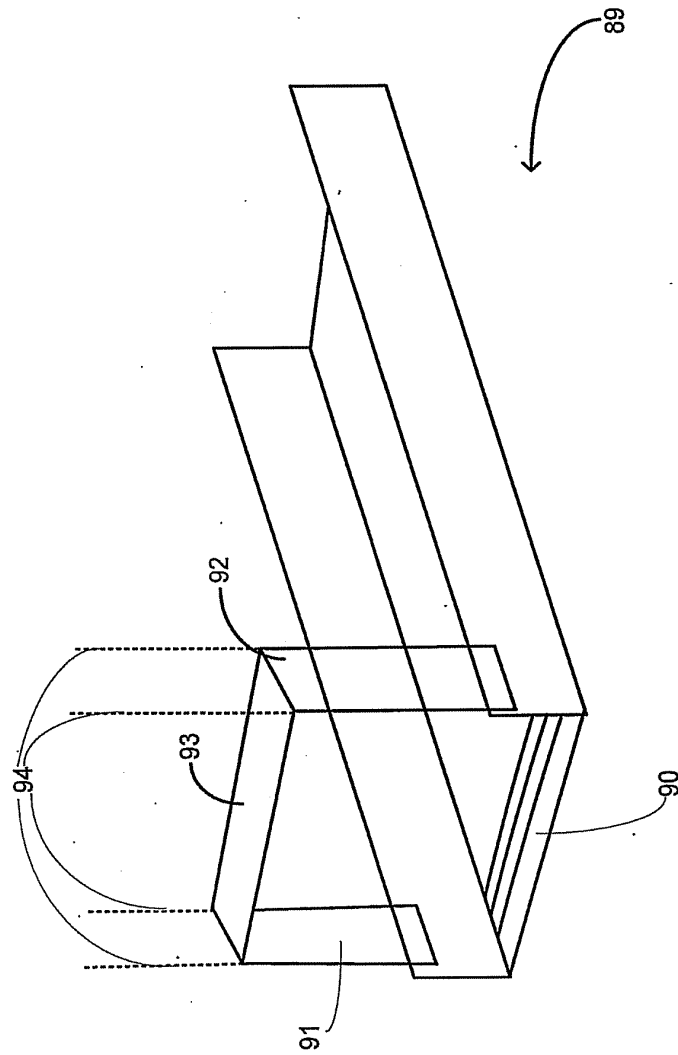


Figure 21

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ2008/000171

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl.		
H01Q 1/38 (2006.01) H01Q 5/00 (2006.01)		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPODOC, WPI, Full Text English (H01Q, antenna, panel, groove, feed and like terms)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1592084 A1 (LK PRODUCTS OY) 2 November 2008	1,17,18,31,82
Y	Abstract, figures, paragraph 7	2,19,20,22-30,32,45,46, 48-64
Y	Whole document	
Y	JP 57-081704 A (MITSUBISHI ELECTRIC CORP.) 21 May 1982	2,32
Y	EPODOC English Abstract, Figure 6	
Y	US 4371877 A (DOUSSOT et al.) 1 February 1983	2,32
Y	Abstract, figures, claims	
Y	Note: This document may be combined with JP 57-081704 and EP 1592084.	
Y	US 2002/0000944 A1 (SABÈT et al.) 3 January 2002	1,2,31,32
Y	Abstract, Figure 13,14, paragraphs 48-51, claims 1,17,20	17,18
Y	Paragraph 7	
Y	Note: This document may be combined with EP 1592084	
☒ Further documents are listed in the continuation of Box C ☒ See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 28 October 2008		Date of mailing of the international search report - 5 NOV 2008
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pot@ipaustalia.gov.au Facsimile No. +61 2 6283 7999		Authorized officer DALE SIVER AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2196

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ2008/000171

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,Y Y	US 2002/0180642 A1 (FRECSKA) 5 December 2002 Paragraph 18 Abstract, paragraphs 16,18, 25,36,37, claims 1,16,18,20	62,63 55-60
Y	ELDEK A.A. "NUMERICAL ANALYSIS OF A SMALL ULTRA WIDEBAND MICROSTRIP FED MONOPOLE ANTENNA" PIER 65,59-69 Published 2006 Figure 1, Section 2 http://ceta.mit.edu/PIER/pier65/05.06082305.Eldek.pdf	11,23,39,64
Y	US 6326920 B1 (BARNETT et al.) 4 December 2001 Abstract, figures, column 1 line 49, column 4 lines 3-7 Column 2 lines 26-61 Note: This document may be combined with EP 1592084	19,20,22,24-30 45,46,48-55,61

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2008/000171**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Claims 1 – 64 ,82 (a method of forming a panel antenna by removing material ie. forming grooves)
Claims 65 -69 (a panel antenna for a belt conveyor having a graduated side profile and friction reducing layer)
Claims 70-81 a panel antenna located in a recess (or slot) of a belt conveyor

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Claims 1 – 64 ,82

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2008)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NZ2008/000171

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
EP	1592084	CN	1691408	FI	20040584
		US	2005237243	US	7218280
JP	57081704	NONE			
US	4371877	DE	3115388	FR	2481526
		JP	56168404	GB	2074792
US	2002000944	AU	27851/01	US	6480162
		US	6906669	US	2002175879
		WO	0152353	US	6664932
US	2002180642	AU	40590/02	CA	2376323
		JP	2003078344	MX	PA02005264
		US	6563465	EP	1265315
US	6326920	CA	2335671	EP	1132997
				JP	2001284960
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.					
END OF ANNEX					

PATENT COOPERATION TREATY

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 7836-107560-PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2009/066345	International filing date (<i>day/month/year</i>) 02 DECEMBER 2009 (02.12.2009)	(Earliest) Priority Date (<i>day/month/year</i>) 02 DECEMBER 2008 (02.12.2008)
Applicant ANDREW LLC et al		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (See Box No. II)

3. ☐ Unity of invention is lacking (See Box No. III)

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the drawings to be published with the abstract is Figure No. 1

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figure is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/066345**A. CLASSIFICATION OF SUBJECT MATTER***H01Q 21/12(2006.01)i, H01Q 21/06(2006.01)i, H01Q 19/10(2006.01)i, H04M 1/00(2006.01)i, G01S 13/00(2006.01)i*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01Q 21/12; H01Q 1/38; H01Q 3/00; H01Q 5/00; H04M 1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: panel, antenna, radome, enclosure

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2007-0001919 A1 (NIALLO CARROLL et al.) 04 January 2007 See Abstract, Claims 1-18, Figures 1-8 Description of the Preferred Embodiments	1-18
A	WO 2009-011601 A1 (TIMES-7 HOLDINGS LIMITED et al.) 22 January 2009 See Abstract, Claims 1-5, Figures 1-21 Detailed Description of the Invention	1-18

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

25 JUNE 2010 (25.06.2010)

Date of mailing of the international search report

25 JUNE 2010 (25.06.2010)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, Saang Woong

Telephone No. 82-42-481-8210



Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US2009/066345

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007-0001919 A1	04.01.2007	EP 1851825 A1 GB 0426319 D0 WO 2006-059230 A1 WO 2006-059230 A1	07.11.2007 05.01.2005 08.06.2006 08.06.2006
WO 2009-011601 A1	22.01.2009	AU 2008-276731 A1	22.01.2009

Form PCT/ISA/210 (patent family annex) (July 2009)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

DANIEL M. GURFINKEL

HUSCH BLACKWELL SANDERS WELSH & KATZ 120
SOUTH RIVERSIDE PLAZA SUITE 2200 CHICAGO IL
60606 USA

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) 25 JUNE 2010 (25.06.2010)

Applicant's or agent's file reference
7836-107560-PCT

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2009/066345

International filing date (day/month/year)

02 DECEMBER 2009 (02.12.2009)

Priority date (day/month/year)

02 DECEMBER 2008 (02.12.2008)

International Patent Classification (IPC) or both national classification and IPC

H01Q 21/12(2006.01)i, H01Q 21/06(2006.01)i, H01Q 19/10(2006.01)i, H04M 1/00(2006.01)i, G01S 13/00(2006.01)i

Applicant

ANDREW LLC et al

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR



Korean Intellectual Property Office
Government Complex-Daejeon, 139
Seonsa-ro, Seo-gu, Daejeon 302
-701, Republic of Korea
Facsimile No. 82-42-472-7140

Date of completion of this opinion

25 JUNE 2010 (25.06.2010)

Authorized officer

LEE, Saang Woong

Telephone No. 82-42-481-8210



Form PCT/ISA/237 (cover sheet) (July 2009)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2009/066345

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. a sequence listing filed or furnished
 - ☐ on paper
 - ☐ in electronic form
 - b. time of filing or furnishing
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
5. ☐ In addition, in the case that more than one version or copy of a sequence listing as been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2009/066345

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-18	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	1-18	YES
	Claims	NONE	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims	NONE	NO

2. Citations and explanations :

A. Reference is made to the following documents:

Reference is made to the following documents identified in the International Search Report(ISR):

D1: US 2007-0001919 A1 (NIALLO CARROLL et al.) 04 January 2007
D2: WO 2009-011601 A1 (TIMES-7 HOLDINGS LIMITED et al.) 22 January 2009

B. Reasoned statement with regard to novelty and inventive step:

1. Novelty and Inventive step regarding claims 1-18:

D1, which is considered to represent the most relevant state of the art, discloses an antenna assembly for a cellular telecommunications system having an array of radiating elements, patches, situated in front of a panel having an electrically conductive face, from which the subject matter of claims 1, 12, 16 differs in that a panel antenna comprising an enclosure including a rectangular rear panel and first, second, third walls extended from longitudinal edges and those walls, an inner seal, a plurality of micro radios, a radome, and these are not disclosed in D1, accordingly, are also considered to be not obvious to a person skilled in the art by D1 or D2, taken alone or in combination.

Claims 2-11 are dependent on claim 1, claims 13-15 on claim 12, claims 17-18 on claim 16, therefore the claims meet the requirements of novelty and inventive step.

Therefore, the subject matter of claims 1-18 is being considered to be novel and to involve an inventive step under PCT Article 33(2) and (3).

C. Reasoned statement with regard to industrial applicability

Claims 1-18 meet the criteria set out in PCT Article 33(4), because all the claims are considered to be industrially applicable.

Electronic Acknowledgement Receipt

EFS ID:	8062007
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Daniel Michael Gurfinkel/Richard Sensenbrenner
Filer Authorized By:	Daniel Michael Gurfinkel
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	21-JUL-2010
Filing Date:	02-JUN-2010
Time Stamp:	15:52:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		107560cip.pdf	4601172	yes	64
			bced0f7ed2487aba48d766c3ee3f74ef0c41549		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Miscellaneous Incoming Letter	1	1
	Transmittal Letter	2	3
	Information Disclosure Statement (IDS) Filed (SB/08)	4	5
	Foreign Reference	6	58
	NPL Documents	59	64
Warnings:			
Information:			
Total Files Size (in bytes):		4601172	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.			

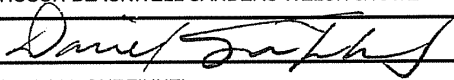
Doc Code: TRAN.LET

Document Description: Transmittal Letter

PTO/SB/21 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM (to be used for all correspondence after initial filing)	Application Number	12/792,367	
	Filing Date	2 June 2010	
	First Named Inventor	RODGER	
	Art Unit	2821	
	Examiner Name	To be assigned	
Total Number of Pages in This Submission	57	Attorney Docket Number	7836-107560-CIP

ENCLOSURES (Check all that apply)		
☐ Fee Transmittal Form	☐ Drawing(s)	☐ After Allowance Communication to TC
☐ Fee Attached	☐ Licensing-related Papers	☐ Appeal Communication to Board of Appeals and Interferences
☐ Amendment/Reply	☐ Petition	☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
☐ After Final	☐ Petition to Convert to a Provisional Application	☐ Proprietary Information
☐ Affidavits/declaration(s)	☐ Power of Attorney, Revocation	☐ Status Letter
☐ Extension of Time Request	☐ Change of Correspondence Address	☐ Other Enclosure(s) (please identify below):
☐ Express Abandonment Request	☐ Terminal Disclaimer	
☒ Information Disclosure Statement	☐ Request for Refund	
☐ Certified Copy of Priority Document(s)	☐ CD, Number of CD(s) _____	
☐ Reply to Missing Parts/Incomplete Application	☐ Landscape Table on CD	
☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53	Remarks	
SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT		
Firm Name	HUSCH BLACKWELL SANDERS WELSH & KATZ	
Signature		
Printed name	Daniel M. GURFINKEL	
Date	21 July 2010	Reg. No. 34,177

CERTIFICATE OF TRANSMISSION/MAILING		
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:		
Signature		
Typed or printed name		Date

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	12/792,367	)	Confirmation No.: 4588
Applicant:	RODGER et al.	)	
Filed:	2 June 2010	)	
Art Unit:	2821	)	
Examiner:	To be assigned	)	
Docket No.:	7836-107560-CIP	)	
Customer No.:	24628	)	
Title:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Dear Sir:

Applicant submits herewith information of which he is aware, which it is believed may be material to the examination of this application and in respect of which there may be a duty to disclose in accordance with 37 CFR 1.56. However, submitting this information is not intended to constitute an admission that any patent, publication or other information referred to herein either is "material" pursuant to 37 CFR 1.56 or is "prior art" for this invention.

In accordance with 37 CFR 1.97(g), (h), the filing of the Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR 1.56 exists.

A list of patent(s) and/or publications is set forth on the attached forms PTO/SB/08A and PTO/SB/08B. Copies of all foreign patents and non-patent literature are supplied herewith for the Examiner's convenience.

It is respectfully submitted that the present invention is deemed patentable over the cited references, whether taken singly or in combination. Applicants are submitting these references for consideration by the Examiner and for purposes of entering these citations in the official file in order to comply with their duty of candor.

If a fee is due, the Patents Office is authorized to debit our deposit account No. 230920.

Respectfully Submitted,



Date: 21 July 2010

Daniel M. Gurfinkel
Registration No. 34,177
Husch Blackwell Sanders Welsh & Katz
120 South Riverside Plaza
22nd Floor
Chicago, Illinois 60606-3912
(312) 655-1500



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
12/792,367	06/02/2010	2821	0.00	7836-107560-CIP	8	1

CONFIRMATION NO. 4588

FILING RECEIPT



0000000042109590

24628
Husch Blackwell Sanders, LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606

Date Mailed: 06/16/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Derek RODGER, Inverkeithing, UNITED KINGDOM;
Matthew FERRIS, Plano, TX;

Assignment For Published Patent Application

ANDREW LLC, Hickory, NC

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of PCT/US09/66345 12/02/2009
which claims benefit of 61/119,114 12/02/2008

Foreign Applications

If Required, Foreign Filing License Granted: 06/15/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/792,367**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE

Preliminary Class

343

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER**Title 35, United States Code, Section 184****Title 37, Code of Federal Regulations, 5.11 & 5.15****GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

page 2 of 3

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/792,367	06/02/2010	Derek RODGER	7836-107560-CIP

CONFIRMATION NO. 4588

FORMALITIES LETTER

24628

Husch Blackwell Sanders, LLP
Husch Blackwell Sanders LLP Welsh & Katz
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606



Date Mailed: 06/16/2010

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
Applicant must submit \$330 to complete the basic filing fee for a non-small entity. If appropriate, applicant may make a written assertion of entitlement to small entity status and pay the small entity filing fee (37 CFR 1.27).
- The oath or declaration is missing.
A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$130 for a non-small entity, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is \$1220 for a non-small entity

- \$330 Statutory basic filing fee.
- \$130 Surcharge.
- The application search fee has not been paid. Applicant must submit \$540 to complete the search fee.
- The application examination fee has not been paid. Applicant must submit \$220 to complete the examination fee for a non-small entity.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/rgreen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	<i>Attorney Docket No.</i>	7836-107560-CIP
	<i>First Inventor</i>	RODGER
	<i>Title</i>	PANEL ANTENNA HAVING SEALED...
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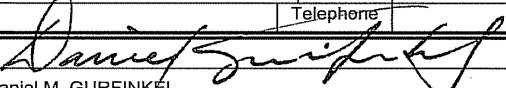
APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria VA 22313-1450
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1. ☐ Fee Transmittal Form (e.g., PTO/SB/17) 2. ☐ Applicant claims small entity status. See 37 CFR 1.27. 3. ☒ Specification [Total Pages <u>19</u>] Both the claims and abstract must start on a new page (For information on the preferred arrangement, see MPEP 608.01(a)) 4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>10</u>] 5. Oath or Declaration [Total Sheets <u> </u>] a. ☐ Newly executed (original or copy) b. ☐ A copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional with Box 18 completed) i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b). 6. ☒ Application Data Sheet. See 37 CFR 1.76 7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix) ☐ Landscape Table on CD 8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. – c. are required) a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	ACCOMPANYING APPLICATION PARTS 9. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 10. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney (when there is an assignee) 11. ☐ English Translation Document (if applicable) 12. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 13. ☐ Preliminary Amendment 14. ☐ Return Receipt Postcard (MPEP 503) (Should be specifically itemized) 15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 16. ☐ Nonpublication Request under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 17. ☐ Other: _____
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18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☒ Continuation-in-part (CIP) of prior application No.: P.C.T./US09/66345

Prior application information: Examiner: _____ Art Unit: _____

19. CORRESPONDENCE ADDRESS									
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This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

APPLICATION DATA SHEET

Application Information

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Suggested Group Art Unit::	None
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Title::	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
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Secrecy Order in Parent Appl.::	No

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Representative Information

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Domestic Priority Information

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	Continuation in part of	PCT/US09/66345	2 December 2009
PCT/US09/66345	Continuation of	61/119,114	2 December 2008

Foreign Priority Information

Country::	Application Number::	Filing Date::	Priority Claimed::

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Panel Antenna Having Sealed Radio Enclosure

Field Of The Invention

[0001] The field of the invention relates generally to panel antennas used in communications applications. More particularly, the field of the invention relates to arrangements of passive and active antenna components in an multiple radiating element panel antenna.

Background Of The Invention

[0002] A typical known Cellular Telephone Base Station System comprises several elements, including one or more panel antennas, each panel antenna comprising an array of radiating elements mounted at an elevation above the ground, and base station electronics mounted remotely from the antenna arrays. The known antenna arrays typically include a plurality of radiating elements and a feed network. The radiating elements and feed network may be mounted on a panel antenna plate. See, e.g., U.S. Patent No. 6,034,649, titled Dual Polarized Base Station Antenna. In some antennas, a ground plane for the radiating elements may be used as a part of the antenna structure. In some known panel antennas, the feed network may include power dividers, phase shifters, or other circuit devices for adjusting beam width and/or beam direction. Typically, however, such known panel antennas have feed networks which comprise passive components, and do not have active devices which perform power amplification.

[0003] Typically, the known panel antennas are driven by a Low Noise Amplifier (LNA). A LNA may be mounted on support structure for the panel antenna or located as part of a base station, comprising an environmental enclosure on the ground below the panel antenna. The LNA may be coupled to the feed network of the panel antenna by coaxial cable. Locating the LNA in the environmental enclosure at the base station facilitates protecting active electronics from the elements. However, such an arrangement also requires extensive cabling

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from the base station environmental enclosure to the location of the panel antenna, which may be located at a significant elevation above the base station.

[0004] Another type of panel antenna is one where individual radio elements are associated with the radiating elements. For example, international patent application WO 2008/1009421, titled "Antenna Array System," discloses an all-digital antenna array. WO 2008/1009421 is incorporated by reference. In the '421 application, a digital signal is provided to a Communications Hub. The Communications Hub distributes the digital signal to a plurality of micro radios. An antenna radiating element is associated with each micro radio. However, the '421 patent application does not consider or solve certain issues with packaging and antenna design.

[0005] For example, in prior art remote radio head antennas, the components in the panel antenna are passive and heat dissipation is not an issue. In the '421 application, however, each micro radio has a power digital to analog converter for converting the digital signal into an RF signal. This power converter generates a significant amount of heat that must be dissipated. The '421 application does not teach or suggest a way to solve the heat dissipation problem. Additionally, locating active electronic components, including power amplifiers in the panel antenna raises substantial issues regarding protecting such electronics from adverse environmental conditions, such as rain and other forms of precipitation. Protection from environmental conditions is not solved in the '421 application. Also, the '421 application does not address issues concerning electromagnetic interference, manufacturing assembly and serviceability.

Summary of The Invention

[0006] According to one example of the present invention, a panel antenna may include an enclosure, an internal cover, one or more micro radios and RF modules, and a radome. The internal cover is dimensioned to overlap an aperture in the enclosure. The aperture provides

access to a cavity of the enclosure. The enclosure may include a rectangular rear panel, side walls with an interior surface to mount micro radios and an external surface to receive heat sinks, and a hinged front cover providing an internal cover. The internal cover may also have a plurality of RF radiating modules fastened thereto. The internal cover may also provide environmental sealing and electromagnetic shielding. The plurality of micro radios are located inside the cavity of the enclosure, and each micro radio is coupled to an RF radiating module. The micro radios may be mounted inside the enclosure on the side walls. The radome encloses the RF radiating modules. The radome may be mounted to the internal seal.

[0007] Additionally, the panel antenna may further include a heat sink mounted on an exterior side of the rear panel. The heat sink on the rear panel may dissipate heat from additional active electronics, such as a communications hub or calibration radio. The micro radios and active electronics may be mounted such that the heat sinks dissipate heat generated by the micro radios.

[0008] In alternate examples of the present invention, a panel antenna may include an enclosure, an internal cover, a plurality of micro radios and RF modules, and a radome. The enclosure may include a rectangular rear panel, and, extending in a longitudinal direction of the enclosure, first walls extending from at least the longitudinal edges of the rear panel, second walls extending from the first walls and being angled inwardly, third walls extending from the second walls, and flange extending from the third wall portion outwardly from the cavity of the enclosure, the flange being substantially parallel with the rear panel, the flange having a mounting locations and a sealing area located between the mounting locations and the third wall portion. The first and third walls may be generally perpendicular to the rear panel. The internal cover may be dimensioned to overlap an area defined by the flange of the enclosure such that the internal cover forms an environmental seal when positioned on the sealing area of the flange. The internal cover may also have a plurality of RF radiating modules fastened thereto. The internal cover may also provide electromagnetic shielding. The plurality of micro radios are

located inside the cavity of the enclosure, and each micro radio is coupled to an RF radiating module. In one example, the micro radios are mounted on the rear panel. In an alternate embodiment, the micro radios may be mounted on the first and third walls. The radome encloses the RF radiating modules.

[0009] Additionally, the panel antenna may further include a heat sink mounted on an exterior side of the rear panel. The micro radios may be mounted such that the heat sinks dissipate heat generated by the micro radios. The ends of the enclosure may be substantially flat end walls, or the shape of the longitudinal walls may be carried through to one or both of the ends of the enclosure.

[0010] A panel antenna according to another alternate example of the present invention includes an enclosure, a radome assembly, and a plurality of micro radios protected by the enclosure and the radome assembly. The enclosure may have a rear panel, a first wall portion extending from the rear panel, a second wall portion and a third wall portion, and a flange extending outwardly from the third wall portion. The second wall portion is angled inwardly toward a cavity of the enclosure, the flange having a mounting locations and a sealing area located between the mounting locations and the third wall portion. The radome assembly may have a radome, a plurality of RF radiating modules fastened thereto, and a seal element located around a periphery of a cavity of the radome. The seal element on the radome assembly may be adapted to form a seal with the sealing area of the flange. Alternatively, the radome assembly may be attached to the enclosure by a hinge. The plurality of micro radios are located inside the enclosure, and each micro radio is coupled to one of the plurality of RF radiating modules. A plurality of micro radios may be located on a micro radio module. In one alternative example, the micro radios are mounted on interior surfaces of first and second side walls, and heat sinks are mounted on exterior surfaces of the side walls.

Brief Description of The Drawings

[0011] Fig. 1 is an illustration of the components of one example of a panel antenna according to the present invention.

[0012] Fig. 2 is a cross-sectional diagram of one example of a housing according to the present invention.

[0013] Fig. 3 is an isometric view of a part of one example of a housing according to the present invention.

[0014] Fig. 4 illustrates another example of a panel antenna according to the present invention with the radome assembly detached.

[0015] Fig. 5 is an illustration of the components of one example of a radome assembly according to the present invention.

[0016] Fig. 6 is a perspective view of another example of a panel antenna according to another aspect of the present invention.

[0017] Fig. 7 is a side view of the panel antenna of Figure 6.

[0018] Fig. 8 is a front view of the panel antenna of Figure 6.

[0019] Fig. 9 is a top view of the panel antenna of Figure 6.

[0020] Fig. 10 is a perspective view of another example of a panel antenna according to another aspect of the present invention.

[0021] Fig. 11 is a side view of the panel antenna of Figure 10.

[0022] The present invention provides a digital Base Station Antenna that provides for protecting a plurality of micro radios from environmental conditions while providing a mechanically rigid, readily serviceable panel antenna.

Detailed Description of The Present Invention

[0023] Referring to Figure 1, in one example, a Panel Antenna 10 comprises an enclosure 12, internal cover 14, radome 16 and rear heat sinks 18. As described in more detail below, the enclosure 12 may be formed from sheet metal. The Panel Antenna 10 may include a plurality of micro radios 20 mounted within the enclosure 12. The micro radios 20 may be thermally coupled to the rear heat sinks 18. In one aspect of the invention, described in more detail below, the internal cover 14 may include a plurality of RF modules 24.

[0024] Referring to Figures 2 and 3, the enclosure 12 comprises a rear panel 30, a lower side wall 32, an angled side wall 34, an upper side wall 36, and a flange 38. In one example, lower side wall 32 and upper side wall 36 are perpendicular to rear panel 30 and flange 38 is parallel to the rear panel 30. Angled side wall 34 is angled toward the interior of the enclosure. The rear panel 30, side walls 32, 34, 36 and flange 38 may be formed from sheet metal. Corners, formed at the junctions of the walls may be welded. Welded corners have the benefit of preventing moisture from entering the enclosure via the corners.

[0025] The combination of the rear panel 30, lower side wall 32, inclined side wall 34, upper side wall 36, and flange 38 may be configured such that these elements, when viewed in cross section, appear in a Z-shape. In one example of the invention, this Z-shape arrangement is employed on two longitudinal sides of the enclosure, and end walls 37 are flat. In alternative examples, the Z-shape may be employed on three sides of the enclosure (e.g., two longitudinal sides and an end) or on all four sides of the enclosure. The Z-shape provides improved structural rigidity over conventional box-style structures.

[0026] In addition to enhancing rigidity, a Z-shaped sidewall enclosure provides enhanced internal space for a given outer flange dimension. For example, for a given flange dimension, the Z-shaped enclosure has more interior volume than a conventional box enclosure having an outward-turned flange of the same dimensions. An inward-turned flange may be used, however, such a flange may have additional challenges regarding sealing against adverse environmental conditions, especially moisture. Additionally, a radome may be configured to slide over and engage the outward-turned flanges, which allows installation and removal of a radome without installing or removing fasteners. This may be advantageous when servicing a Panel Antenna 10 located on a communications tower.

[0027] Flange 38 may be flat and parallel to the rear panel 30. In one example, a flat flange 38 provides an area for facilitating a seal between flange 38 and internal cover 14. In this example, flange 38 includes sealing area 40. Flange 38 may also include a fastening system for the internal cover 14.

[0028] In one example, the sealing area is located between the fastening system and a peripheral opening defined by upper side walls 36. In this example, locating the fasteners on the flange 38 outside the sealing area eliminates the need for the fasteners themselves to be sealed or to be of a sealable design. Thus, many options are available for the fasteners. Additionally fasteners may be added after the sheet metal has been finished (e.g., painted, coated).

[0029] The Panel Antenna 10 includes a communications hub 50, a power supply 52, and a calibration radio 54. In the illustrated example, interconnections between the communications hub, power supply, and calibration radio are protected from adverse environmental conditions by the enclosure 12, internal cover 14, and sealing area 40.

[0030] In the example illustrated in Fig. 1, eight RF modules 24 and sixteen micro radios 20 (each with a duplexer) are shown. Each RF module 24 is coupled to a corresponding pair of micro radios 20. In this example, a first micro radio 20 of a pair of micro radios drives a

first radiating element of the corresponding RF module 24, and a second micro radio 20 of the pair of micro radios drives a second radiating element of the corresponding RF module 24. This arrangement may be used, for example, where the RF modules 24 comprise dual polarized radiating elements.

[0031] Each micro radio 20 is also connected to the communications hub 50. The communications hub 50 is connected to Base Station Equipment (BSE) (not illustrated). A digital signal may be provided by the Base Station Equipment to the communications hub 50. For example, a fiber optic link or other digital transmission medium may provide the connection between the BSE and the communications hub 50. Typically, the communications hub receives digital signals from the BSE, comprising information for RF transmission by the Panel Antenna 10, and transmits digital signals to the BSE, comprising information received by RF signal by the Panel Antenna 10.

[0032] The connection between the communications hub 50 and each micro radio 20 may also be digital. In one example, the communications may comply with the SerDes standard. The communications hub 50 sends signals to the micro radios 20 for RF transmission, and receives signals from the micro radios 20 that correspond to RF signals received by the RF modules 24 and the micro radios 20. The communications hub 50 may also perform amplitude and phase adjustment to control attributes of RF transmission or reception. When amplitude and phase adjustment is performed electronically, a conventional feed network having electro-mechanical power dividers and phase shifters need not be included.

[0033] In one example, a micro radio 20 may comprise a Digital Up Converter, a power Digital to Analog Converter (including a digital to RF converter). The micro radio may comprise a duplex radio, in which case it may also include a Time Division Duplex Switch, a Low Noise Analog to Digital Converter (including an RF to digital converter) and a Digital

Down Converter. A Time Division Duplex Filter couples the Time Division Duplex Switch to a RF module.

[0034] Internal cover 14 may be manufactured from a sheet of aluminum. Other materials may be used for internal cover 14. In the illustrated example, aluminum is selected because the material serves to provide both an environmental seal and an electromagnetic shield. In this example, internal cover 14 protects the micro radios 20 and other electronics in the Panel Antenna 10 from moisture and other environmental hazards, and shields the micro radios 20 and other electronics from the electromagnetic transmissions of the RF modules 24. The RF modules 24, as passive devices, need not be as effectively sealed from the elements as the active electronics. RF signals are carried between the RF modules 24 and micro radios 20 on cables (not shown). The cables may pass through sealed apertures in the internal cover 14.

[0035] The internal cover 14 may also serve as a structural support for the RF modules 24. The RF modules may include a plurality of radio frequency radiating elements. In one illustrated example, the internal cover 14 supports eight RF modules 24. In one example, the RF modules 24 comprise patch antennas, and in particular, dual polarized patch antennas. Alternatively, the RF modules may comprise dipole or cross-dipole antenna elements. In some embodiments, radiating elements may be disposed over a pan-shaped reflector. In other embodiments, radiating elements may be disposed over a ground plane.

[0036] An example of a suitable patch antenna may be found in International Application WO 2006/135956 A1, which is incorporated by reference. In this example, a patch radiator is positioned above a ground plane and excited such that a dual polarized RF signal is produced. This may be accomplished by exciting opposite sides of the radiator in antiphase.

[0037] The internal cover 14 may be drilled to match the enclosure 12, so that mounting hardware may join the internal cover 14 to the enclosure 12. A seal 62 may be located over the studs in the aluminum frame. Alternatively, the seal may be located inside a periphery

defined by the studs. Alternatively, two seals may be provided, a first seal over the studs, and a second seal inside a periphery defined by the studs.

[0038] The radome 16 may include flanges (not illustrated) to engage and slide over edges defined by the flange of the enclosure 12, or the edges of the internal cover 14, or both. Alternatively the radome 16 includes mounting apertures (not illustrated) through which fastening devices may pass.

[0039] Referring to Figures 4 and 5, another example of a Panel Antenna 110 is provided. In this example of the invention, Panel Antenna 110 comprises an enclosure 112, radome assembly 116 and rear heat sinks 118. In this example, enclosure 112 is substantially the same as enclosure 12, the description of which is not repeated herein. Panel Antenna 110 may include a plurality of micro radios 120 mounted within the enclosure 112. The micro radios 120 may be grouped into radio modules 122. The radio modules 122 may be thermally coupled to the rear heat sinks 118. In one aspect of this example, described in more detail below, the radome assembly 116 includes a plurality of RF modules 124.

[0040] In Fig. 5, a radome assembly 116 is illustrated. The radome assembly 116 includes a radome 160, a seal 162, and a plurality of RF modules 124. Each RF module 124 may include a plurality of RF elements. The RF elements may comprise individual modules, pairs or other groups of modules, or a plurality of RF elements in a single module. In one illustrated example, the Radome assembly of Fig. 5 includes eight RF modules. Each RF module 124 comprises one group of radiating elements.

[0041] In the example illustrated in Fig. 5, four radio modules 122 are shown. Each micro radio module 122 in this example includes two micro radios 120. The radio modules 122 are not limited to two micro radios, and may contain additional micro radios. Each micro radio 120 is connected to a corresponding RF module. Each micro radio 120 is also connected to the communications hub 150. The communications hub is connected to Base Station Equipment. A

digital signal may be provided by the Base Station Equipment to the communications hub. A fiber optic link or other digital transmission medium may provide the connection. The connection between the communications hub and each micro radio may also be digital.

[0042] The radome assembly 116 may include an aluminum frame 164 with studs 166. In one example, the reflecting elements of the RF modules 124 are integrated with the aluminum frame 164. The seal 162 may be located over the studs in the aluminum frame. Alternatively, the seal may be located inside a periphery defined by the studs. Alternatively, two seals may be provided, a first seal over the studs, and a second seal inside a periphery defined by the studs.

[0043] The radome 160 includes mounting locations 168. In one example, the mounting locations 168 may comprise apertures through which fastening devices may pass. In one example, the RF modules 124 are located within the radome 160 with brackets 170 and screws 172, which pass through mounting locations 168. Alternatively, clips or bonding agents may be used to secure the RF modules 124 to radome 160. Providing mounting locations 168 in the radome 160 helps ensure accurate positioning of the RF elements in the radome 160.

[0044] In the illustrated example, the RF modules 124 may be installed in the radome 160 to comprise the radome assembly 116. In this arrangement, electronic components, such as the micro radios 120, may be accessed without disturbing the location of the RF modules 124 in the radome 160. However, the RF modules 124 may be removed from the radome assembly 116 if service is required.

[0045] As in the earlier-described example, the RF modules 124 may comprise patch antennas, and in particular, dual polarized patch antennas. Alternatively, the RF modules may comprise dipole or cross-dipole antenna elements. In some embodiments, radiating elements may be disposed over a pan-shaped reflector. In other embodiments, radiating elements may be disposed over a ground plane.

[0046] Referring to Figures 6-9, in another example, a Panel Antenna 210 may include an enclosure 212, internal cover 214, radome 216, rear heat sinks 218 and side heat sinks 219. The enclosure 212 may be formed from sheet metal such as aluminum or steel. The Panel Antenna 210 may include a plurality of micro radios 220 mounted within the enclosure 212. The micro radios 220 may be thermally coupled to the side heat sinks 219. In one aspect of the invention, described in more detail below, the internal cover 214 may have a plurality of RF modules 224 mounted thereon.

[0047] Figures 7 and 8 illustrate panel antenna 210 without radome 216 so that RF modules 224 are visible.

[0048] The enclosure 212 comprises a rear panel 230, side walls 232, a top wall 234 and a bottom wall 236. While many aspects of the previously described embodiments may be shared with the present embodiment, such as the internal environmental and RF shielding, in this example, a difference is that the side walls 232 are not Z-shaped. Instead, side walls 232 have an area sufficient to mount micro radios 220 to an internal surface and side heat sinks 219 to an external surface. micro radios 220 may be mounted on the internal surfaces of one or both of the side walls 232 of enclosure 212.

[0049] The enclosure 212 includes an inward-turned flange 238 and an outwardly extending lip 239. The outwardly extending lip 239 is joined to an inner periphery of flange 238, and defines an opening through which an interior of the enclosure 212 may be accessed. Internal cover 214 has a lip 215 around its perimeter, and is dimensioned to enclose lip 239. In one embodiment, resilient seals may be included in the interface between lip 239 and lip 215. The resilient seals may provide environmental sealing, RF shielding, or both. Also, internal cover 214 may be attached to enclosure 212 by a hinge 217 running lengthwise along enclosure 212, allowing internal cover 214 to swing open and closed.

[0050] Alternately, the enclosure 212 may be configured with Z-shaped walls, as illustrated in earlier embodiments, provided that the lower side walls have sufficient area on which to mount micro radios and heat sinks. The electronics of this embodiment are similar to previously-described embodiments.

[0051] The Panel Antenna 210 includes a communications hub 250, a power supply (not illustrated), and a calibration radio 254. Interconnections between the communications hub, power supply, and calibration radio are protected from adverse environmental conditions by the enclosure 212, internal cover 214, lip 215 and lip 239. The communications hub 250, power supply and calibration radio 254 may be mounted on rear panel 230 and be thermally coupled to rear heat sinks 218.

[0052] In the example illustrated in Figures 6-9, two RF modules 224 and four micro radios 220 are included. (Figure 6 illustrates two micro radios 220 on a front side wall; the other two, on the internal surface of the second side wall, are not visible.) Each RF module 224 is coupled to a corresponding pair of micro radios 220. In this example, a first micro radio 220 of a pair of micro radios drives a first radiating element of the corresponding RF module 224, and a second micro radio 220 of the pair of micro radios drives a second radiating element of the corresponding RF module 224. This arrangement may be used, for example, where the RF modules 224 comprise dual polarized radiating elements.

[0053] In an alternate example, illustrated in Figures 10-11, four RF Modules 224 and eight micro radios 220 are included in panel antenna 210a. Other components sharing common reference characters are substantially the same as with the example illustrated in Figures 6-9. Panel Antenna 210a includes an enclosure 212a having longer side walls 232a and two internal covers 214 and two radomes 216 (only one radome 216 is illustrated to allow a view of two of the radiating elements 224.) This would allow the internal covers 214 to be opened

independently of each other or at the same time. Alternately, a single internal cover and radome may be used.

[0054] Each micro radio 220 is also connected to the communications hub 250. The communications hub 250 is connected to Base Station Equipment (BSE) (not illustrated). A digital signal may be provided by the Base Station Equipment to the communications hub 250. For example, a fiber optic link or other digital transmission medium may provide the connection between the BSE and the communications hub 250. Typically, the communications hub receives digital signals from the BSE, comprising information for RF transmission by the Panel Antenna 210a, and transmits digital signals to the BSE, comprising information received by RF signal by the Panel Antenna 210a.

[0055] The connection between the communications hub 250 and each micro radio 220 may be the same as described above with respect to the earlier embodiments. Additionally, the micro radios 220 may operate as described with respect to micro radios 20, above.

[0056] Internal cover 214 may be manufactured from a sheet of aluminum. Other materials such as stainless steel and powder-coated steel may be used for internal cover 214. The material is selected to provide both an environmental seal and an electromagnetic shield. In this example, internal cover 214 protects the micro radios 220 and other electronics in the Panel Antenna 210 or 210a from moisture and other environmental hazards, and shields the micro radios 220 and other electronics from the electromagnetic transmissions of the RF modules 224. The RF modules 224, as passive devices, need not be as effectively sealed from the elements as the active electronics. RF signals are carried between the RF modules 224 and micro radios 220 on cables (not shown). The cables may pass through sealed apertures in the internal cover 214.

[0057] The internal cover 214 may also serve as a structural support for the RF modules 224. The RF modules may include a plurality of radio frequency radiating elements. In one illustrated example, the internal cover 214 supports two RF modules 224. As set forth

above, in one example, the RF modules 224 comprise patch antennas, and in particular, dual polarized patch antennas. Alternatively, the RF modules may comprise dipole or cross-dipole antenna elements. In some embodiments, radiating elements may be disposed over a pan-shaped reflector. In other embodiments, radiating elements may be disposed over a ground plane. In some embodiments, internal cover 214 may serve as a ground plane or reflector.

[0058] As with the examples given above, an example of a suitable patch antenna may be found in International Application WO 2006/135956 A1, which is incorporated by reference.

[0059] While in the examples above, the internal cover 214 may be mounted to enclosure 212 by hinge 217, other mounting arrangements for internal cover 214 are contemplated, including the internal cover 14 mounting arrangements set forth with respect to enclosure 12 above, such as a flange and seal arrangement.

[0060] The radome 216 is mounted to the internal cover 214. Alternatively, the radome 216 may include flanges (not illustrated) to engage and slide over edges defined by a flange of the enclosure 212, or edges of the internal cover 214, or both. Alternatively the radome 216 includes mounting apertures (not illustrated) through which fastening devices may pass.

[0061] In an alternative embodiment, the enclosure 212 may be combined with the radio modules 122 and RF modules 124 of Panel Antenna 110, described above. In this example, the RF modules 124 would be installed in a radome to comprise a radome assembly.

[0062] An advantage of the above examples, electronic components, such as the micro radios 220, may be accessed without disturbing the location of the RF modules 224 with respect to the internal cover 214 or the radome 216. However, the RF modules 224 may be removed from the radome assembly if service is required.

What is Claimed is:

1. A panel antenna, comprising:

an enclosure, the enclosure including a rear panel, a first side wall, and a second side wall, a top wall and a bottom wall, the rear panel and the walls defining a cavity, the walls further defining an aperture through which the cavity of the enclosure may be accessed

an internal cover, the internal cover being dimensioned to overlap an area defined by the aperture of the enclosure and providing an environmental seal and electromagnetic shielding for the cavity, the internal cover having at least one RF radiating module fastened to an exterior surface thereof,

at least one micro radio mounted to an internal surface of the first side wall, the micro radio being coupled to the RF radiating module;

a first heat sink, mounted to an external surface of the first side wall, and

a radome, the radome mounting to the internal cover and enclosing the RF radiating module.

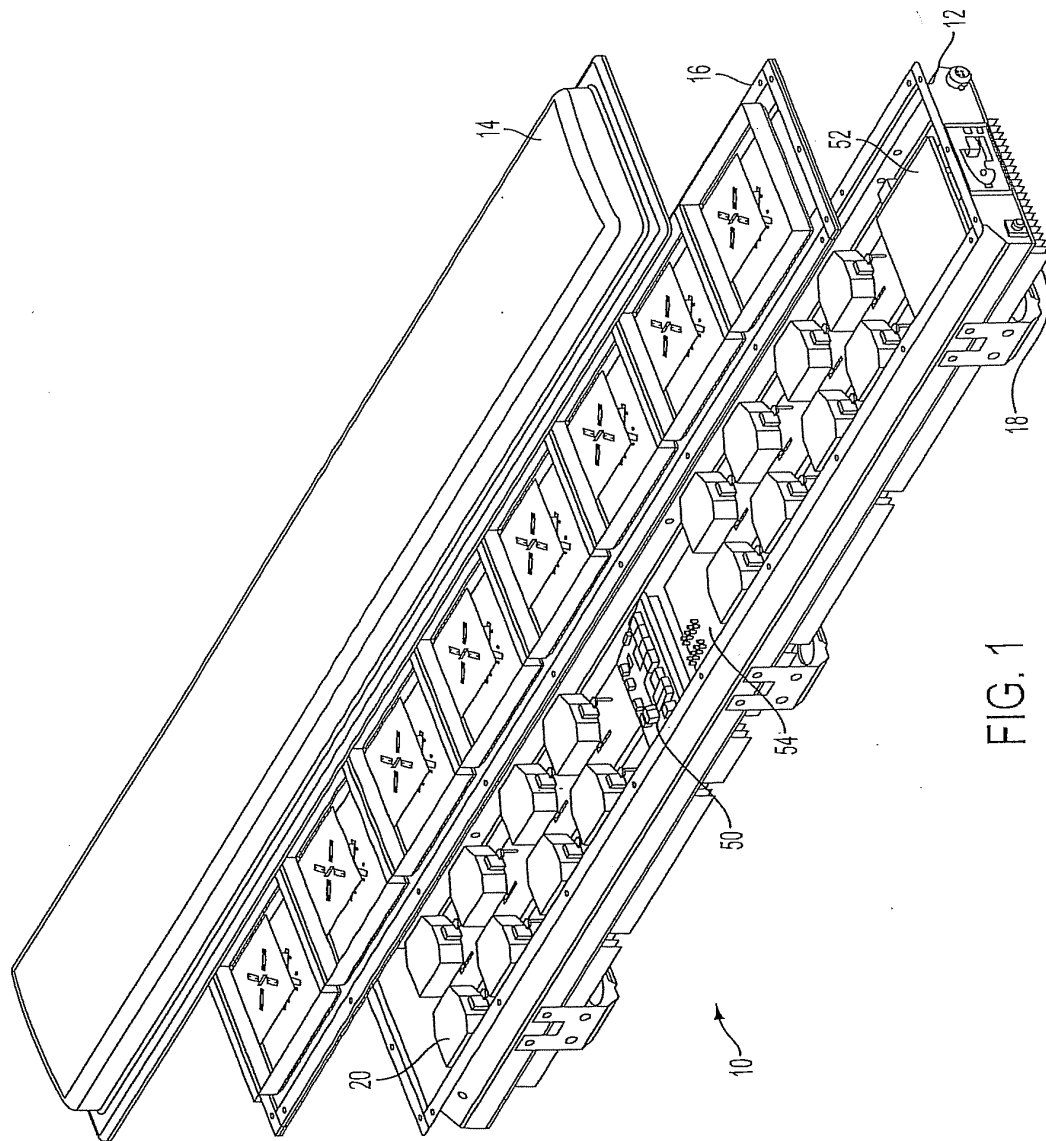
2. The panel antenna of claim 1, wherein the panel antenna further comprises: a second micro radio, the second micro radio mounted to an internal surface of the second side wall, a plurality of RF radiating modules, a second heat sink mounted on an exterior surface of the second side wall.
3. The panel antenna of claim 2, wherein each RF radiating element is dual polarized and is associated with two micro radios.
4. The panel antenna of claim 1, further comprising a communications hub coupled to each micro radio.
5. The panel antenna of claim 4, further comprising a calibration radio.
6. The panel antenna of claim 5, wherein the communications hub and calibration radio are mounted on an interior surface of the rear panel, and a third heat sink is mounted on an exterior surface of the rear panel.
7. The panel antenna of claim 1, wherein a flange joins the first and second side walls and the top and bottom wall, further defining the aperture through which the cavity of the enclosure may be accessed.

8. The panel antenna of claim 1, wherein a flange joins the first and second side walls and the top and bottom wall, and a lip extends from the flange, further defining the aperture through which the cavity of the enclosure may be accessed, the lip being engaged by the internal cover to provide the environmental seal.

ABSTRACT

A panel antenna having an enclosure, an internal cover, one or more micro radios and RF modules, and a radome is provided. The enclosure may include a rectangular rear panel, side walls with an interior surface to mount micro radios and an external surface to receive heat sinks, and a hinged front cover providing an internal cover. The internal cover may also have a plurality of RF radiating modules fastened thereto. The internal cover may also provide environmental sealing and electromagnetic shielding. The plurality of micro radios are located inside the cavity of the enclosure, and each micro radio is coupled to an RF radiating module. The micro radios may be mounted inside the enclosure on the side walls. The radome encloses the RF radiating modules. The radome may be mounted to the internal seal. Additionally, the panel antenna may further include a heat sink mounted on an exterior side of the rear panel. The heat sink on the rear panel may dissipate heat from additional active electronics, such as a communications hub or calibration radio. The micro radios and active electronics may be mounted such that the heat sinks dissipate heat generated by the micro radios.

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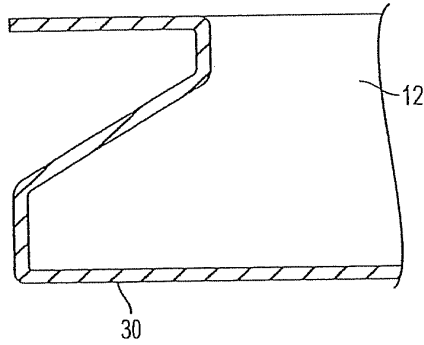


FIG. 2

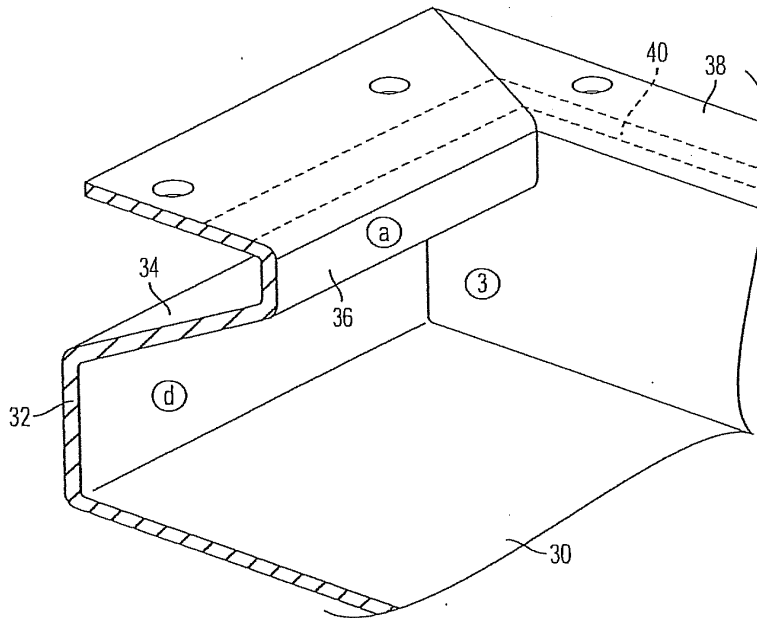


FIG. 3

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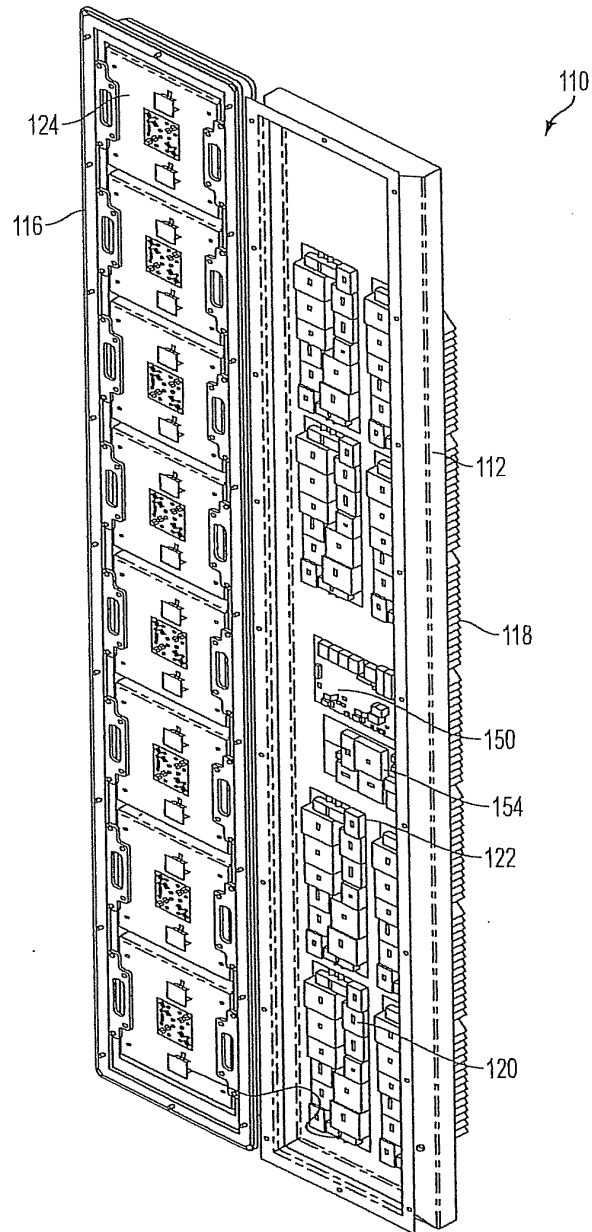


FIG. 4

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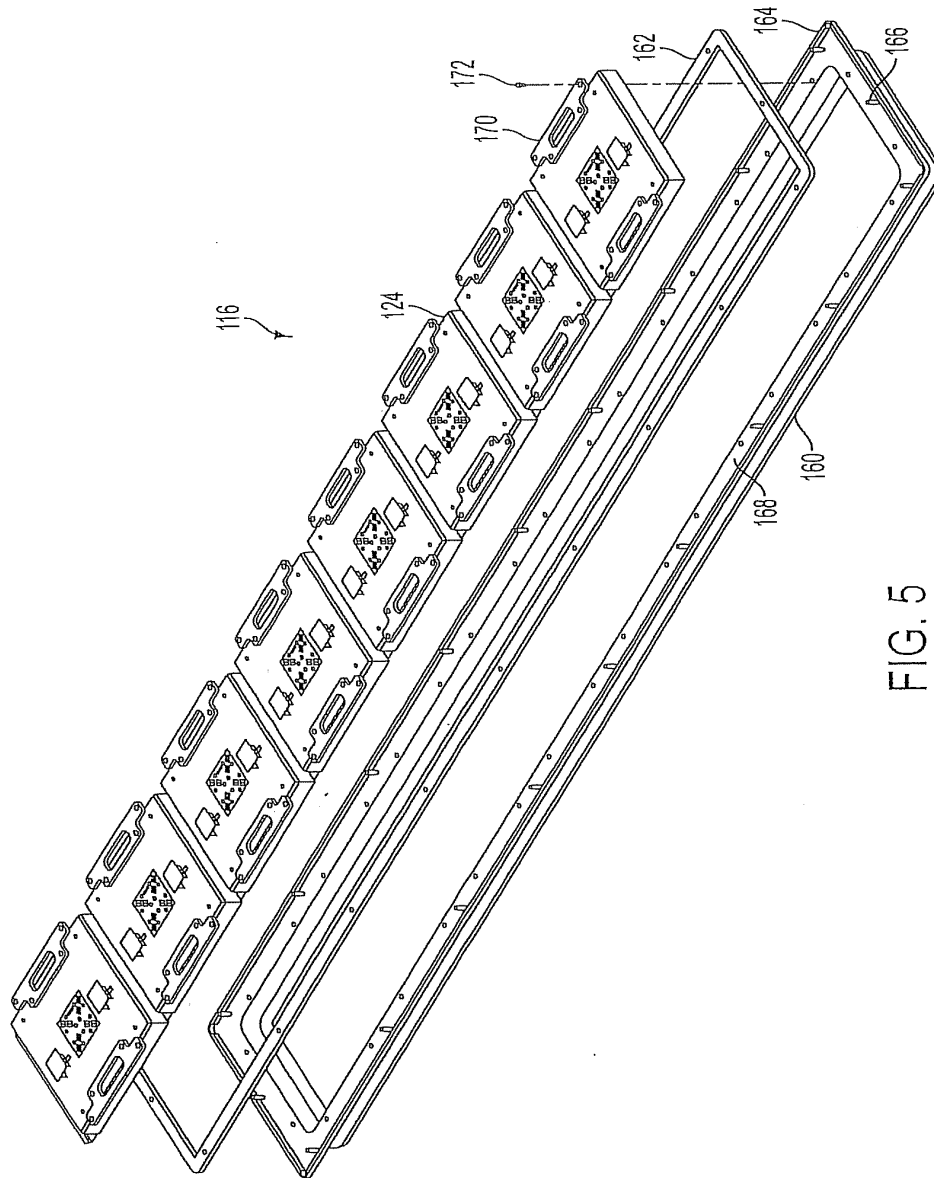


FIG. 5

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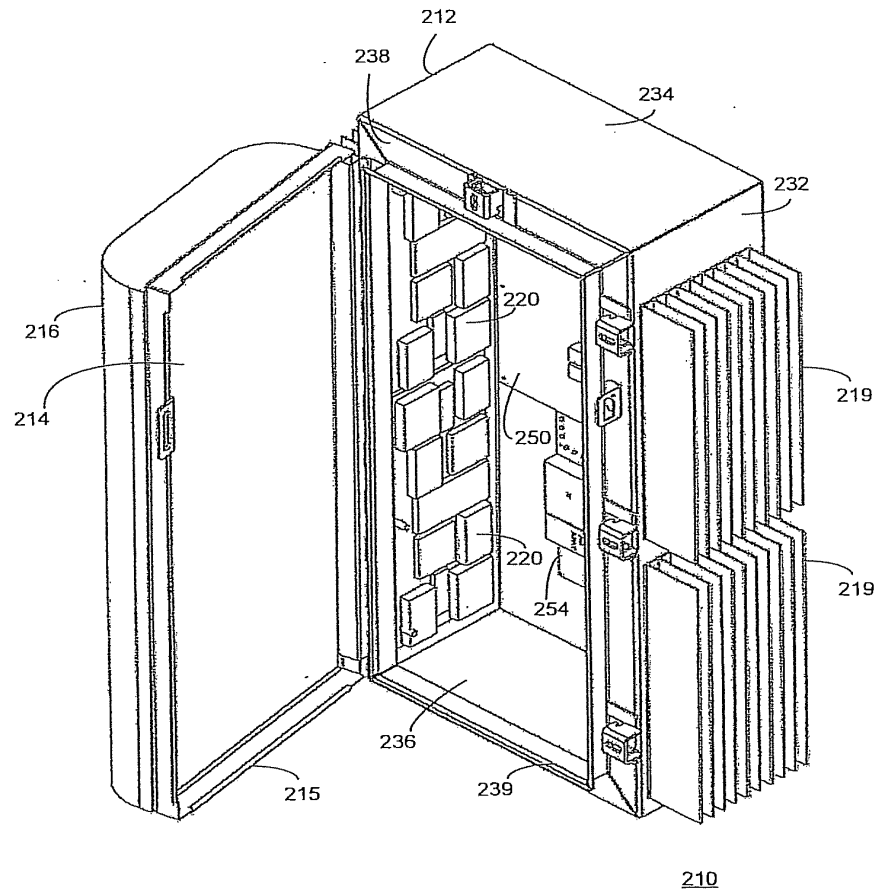


Figure 6

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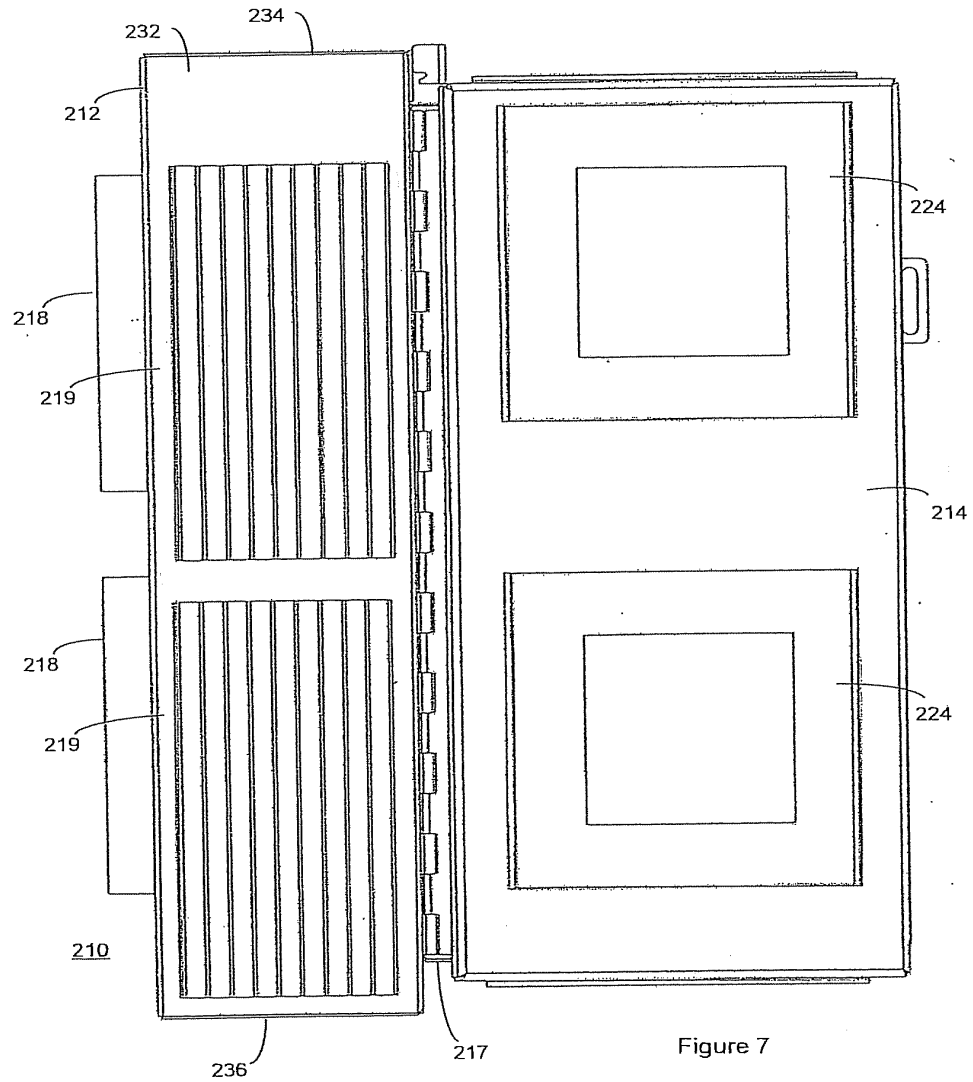


Figure 7

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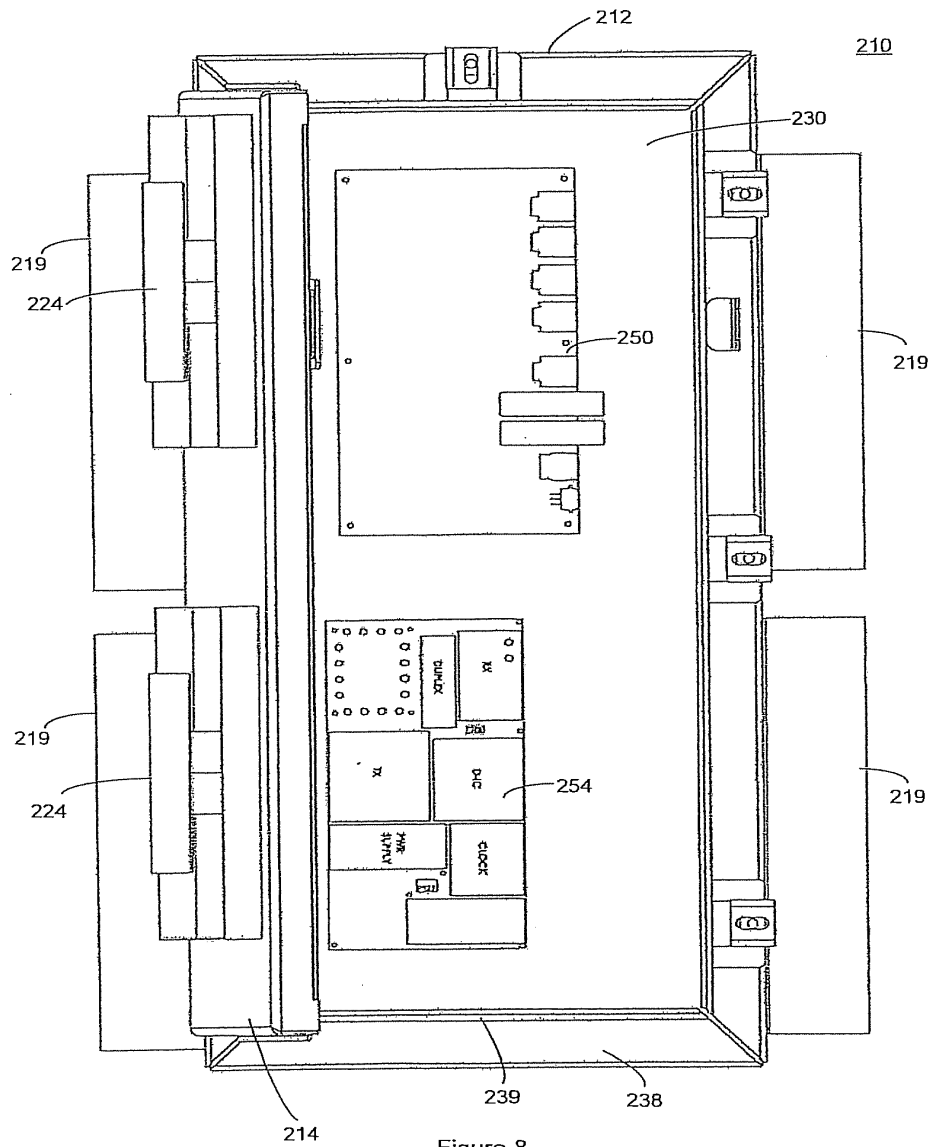


Figure 8

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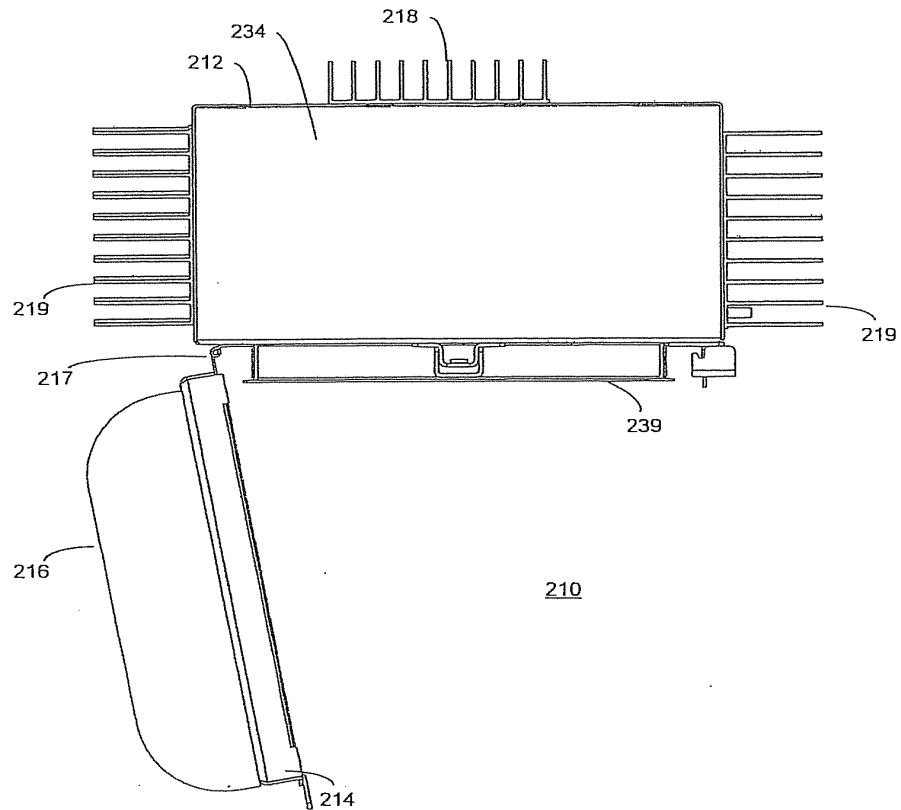


Figure 9

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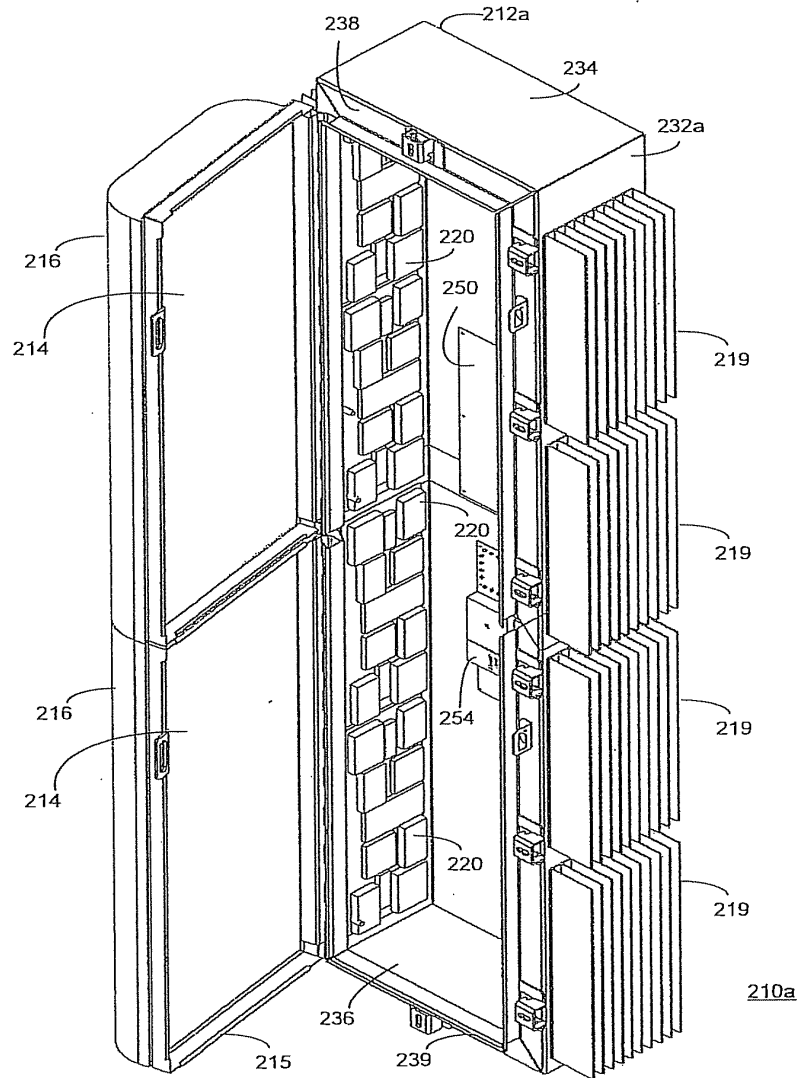


Figure 10

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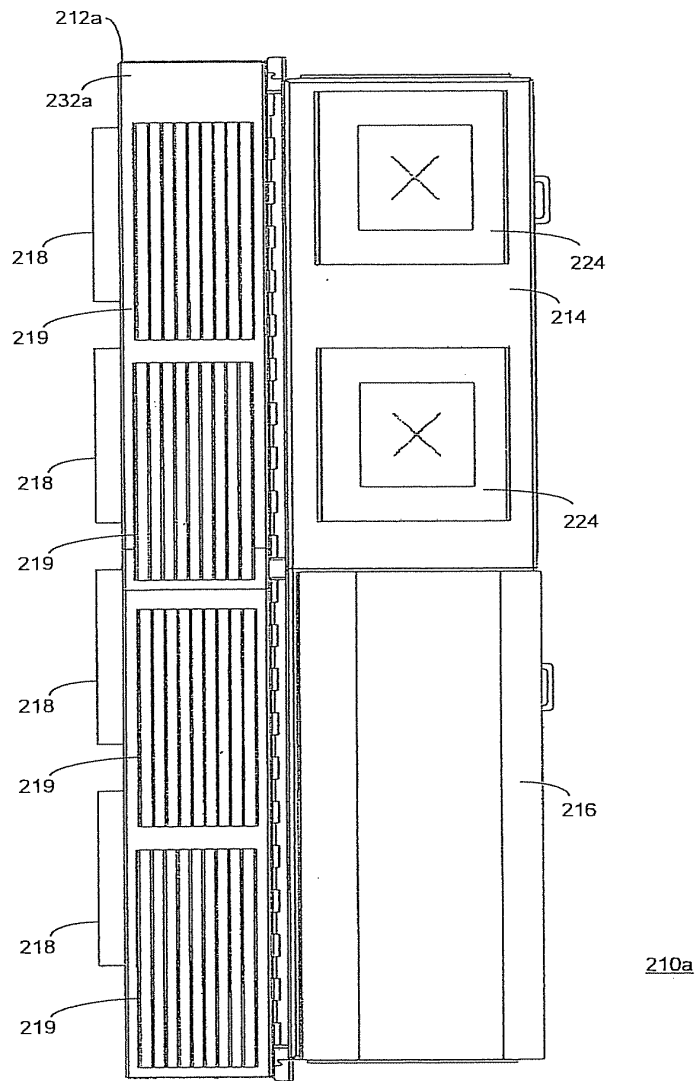


Figure 11

Electronic Acknowledgement Receipt

EFS ID:	7731829
Application Number:	12792367
International Application Number:	
Confirmation Number:	4588
Title of Invention:	PANEL ANTENNA HAVING SEALED RADIO ENCLOSURE
First Named Inventor/Applicant Name:	Derek RODGER
Customer Number:	24628
Filer:	Daniel Michael Gurfinkel/Richard Sensenbrenner
Filer Authorized By:	Daniel Michael Gurfinkel
Attorney Docket Number:	7836-107560-CIP
Receipt Date:	02-JUN-2010
Filing Date:	
Time Stamp:	16:35:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		107560cip.pdf	489615	yes	34
			fcc78f9112d1369bbea20972bd2d22a7b4a1507e		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Transmittal of New Application	1	1
	Application Data Sheet	2	5
	Specification	6	20
	Claims	21	23
	Abstract	24	24
	Drawings-only black and white line drawings	25	34
Warnings:			
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Date: 06/02/10

PTO/SB/06 (12-04)

Approved for use through 7/31/2006. OMB 0651-0032

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 12/792,367		
APPLICATION AS FILED – PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OR	
OTHER THAN SMALL ENTITY							
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A		N/A	330	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A		N/A	540	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A		N/A	220	
TOTAL CLAIMS (37 CFR 1.16(i))	8	minus 20 =	x\$26		x\$52		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x\$110		x\$220		
APPLICATION SIZE FEE (37 CFR 1.16(s))			If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$270 (\$135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR				
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
			195		390		
			TOTAL		TOTAL	1090	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED – PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
OTHER THAN SMALL ENTITY						OR	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	X =	X =	
	Independent (37 CFR 1.16(h))	*	Minus ***	=	X =	X =	
	Application Size Fee (37 CFR 1.16(s))			N/A		N/A	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			TOTAL		TOTAL	
			ADD'T FEE		ADD'T FEE		
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	X =	X =	
	Independent (37 CFR 1.16(h))	*	Minus ***	=	X =	X =	
	Application Size Fee (37 CFR 1.16(s))			N/A		N/A	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			TOTAL		TOTAL	
			ADD'T FEE		ADD'T FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.							

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EX-1002

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