



UNITED STATES
PATENT AND TRADEMARK OFFICE

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/250,099

RECEIPT DATE / TIME
12/23/2024 03:38:30 PM Z ET

ATTORNEY DOCKET #
08610001C10

Title of Invention

BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # 10797783

CONFIRMATION # 8679

FILED BY Michael Whitham

PATENT CENTER # 68496690

FILING DATE 01/17/2019

CUSTOMER # 30743

FIRST NAMED INVENTOR Theodore S. Rappaport

CORRESPONDENCE ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
certificatePatentA.pdf	1	Miscellaneous Incoming Letter	14 KB
US Pat. No. 10797783 - Certificate of Correction.pdf	2	Request for Certificate of Correction	185 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
certificatePatentA.pdf	F160D20736D9CC7517A8E4E047CEE35C7E7C97225A1A8943 C6C1757D318E7C2EFDB1603280BFB21DA5B4ACAB14826604 98837266F61DE5CB1DC0C008B3F57937
US Pat. No. 10797783 - Certificate of Correction.pdf	0ED51695A784E82B3EE872EEC811344B76A90A047D0487557 A195B3AA6D5BF774CD2E534C684293DB460B67314DFA2EA2

73F20B313A658DB07D909AAB12F8917

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 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re US Patent 10,797,783 of Rappaport Issued October 6, 2020
From US Serial No. 16/250099 Confirmation No. 8679
Filed Jan. 17, 2019
For Broadband Repeater with Security for Ultrawideband Technologies

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

**REQUEST FOR CERTIFICATE OF CORRECTION UNDER
37 C.F.R. 1.322**

Sir:

A number of errors have been found in the patent as detailed by form
PTO/SB/44 filed concurrently herewith. From a review of the file, these errors
were made on the part of the USPTO, and correction without a fee is requested.

Respectfully submitted,

/Michael E. Whitham/

Michael E. Whitham
Reg. No. 32,635

WCF IP
11491 Sunset Hills Road, Suite 340
Reston, VA 20190
Tel. (703) 787-9400
Fax. (703) 787-7557
Customer No.: 164319

**UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION**Page 1 of 1

PATENT NO. : 10,797,783
APPLICATION NO.: 16/250,099
ISSUE DATE : October 6, 2020
INVENTOR(S) : Theodore S. Rappaport

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 23, Line 7, delete "a wireless transmitter that transmits wireless data through" and insert -- a wireless transmitter that transmits wireless data through --.

Column 23, Line 8, delete "electromagnetic signales" and insert -- electromagnetic signals --.

Column 23, Lines 22-23, delete "wherein the wireless network is configured for determining whether and" and insert -- wherein the wireless network is configured for determining whether any --.

Column 23, Lines 61-62, delete "determining whether any, a portion, or all information in the process wireless data should be transmitted" and insert -- determining whether any, a portion, or all information in the processed wireless data should be transmitted --.

Column 24, Lines 43-44, delete "determining whether any, a portion, or all information in the process wireless data should be transmitted" and insert -- determining whether any, a portion, or all information in the processed wireless data should be transmitted --.

Column 25, Lines 13-14, delete "determining whether any, a portion, or all information in the process wireless data should be" and insert -- determining whether any, a portion, or all information in the processed wireless data should be --.

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

Whitham, Cook & Fields P.C.
11491 Sunset Hills Road, STE 340
Reston VA 20190

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/250,099	10/06/2020	10797783	08610001C10	8679

30743 7590 09/16/2020
W&C IP
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SUITE 340
RESTON, VA 20190

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 0 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):

Theodore S. Rappaport, Riner, VA;

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

Application Number		
Filing Date		
First Named Inventor	Ted RAPPAPORT	
Art Unit		
Examiner Name		
Attorney Docket Number	08610001C10	

Change(s) applied
to document,
J.G./
7/21/2020

1	20040157550	A1	2004-08-12	Nakagawa	
2	20020093928	A1	2002-07-18	LoGalbo et al. ~~Motorola INC.~~	
3	20040259494	A1	2004-12-23	Mazar ~~Cardiac Pacemakers INC.~~	
4	20030162504	A1	2003-08-28	Sabongi et al.	
5	20030220075	A1	2003-11-27	Baker et al.	
6	20060285577	A1	2006-12-21	Santhoff et al. ~~Pulse Link INC.~~	
7	20050018640	A1	2005-01-27	Fullerton et al.	
8	20050197121	A1	2005-09-05	Fujiwara et al.	
9	20030162528	A1	2003-11-13	Dagleish et al.	
10	20030211828	A1	2003-08-28	Juzswik	
11	20040178928	A1	2004-09-16	Butzer et al.	

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

Application Number		
Filing Date		
First Named Inventor	Ted RAPPAPORT	
Art Unit		
Examiner Name		
Attorney Docket Number	08610001C10	

	42	7787513	B2	2010-08-31	Siwiak et al.	
	43	6806821	B2	2004-10-19	McLemore	
	44	7983613	B2	2011-07-19	Rappaport	
Change(s) applied to document, /J.G./ 7/21/2020	45	6754882	B1	2004-06-22	Sanchez et al. ~~XLINX INC.~~	
	46	8331854	B2	2012-12-11	Rappaport	
	47	5592491	A	1997-01-07	Dinkins	
	48	4659878	A	1987-04-21	Dinkins	
	49	5633876	A	1997-05-27	Dinkins	
	50	4932049	A	1990-06-05	Lee	
	51	5086506	A	1992-02-04	Hall et al.	
	52	6671351	B2	2003-12-30	Menard et al.	

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

Application Number		
Filing Date		
First Named Inventor	Ted RAPPAPORT	
Art Unit		
Examiner Name		
Attorney Docket Number	08610001C10	

	31	8483319	B2	2013-07-09	Tang	
	32	8175191	B2	2012-05-08	Tang et al.	
Change(s) applied to document, /J.G./ 7/21/2020	33	7945215	B2	2011-05-17	Tang ~~Adaptrum INC.~~	
	34	7289813	B2	2007-10-30	Karaoguz	
	35	6348986	B1	2002-02-19	Doucet et al.	
	36	6186908	B1	2001-02-13	Kawasaki et al.	
	37	6934511	B1	2005-08-23	Lovinggood et al. ~~Andrew Corp.~~	
	38	5012211	A	1991-04-30	Young et al. ~~Hughes Aircraft Co.~~	
	39	4626845	A	1986-12-02	Ley ~~Epic Systems INC.~~	
	40	4298179	A	1981-11-03	Gilcher ~~American Standard INC.~~	
	41	6952456	B1	2005-10-04	Aiello et al. ~~Pulse Link INC.~~	

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

Application Number		
Filing Date		
First Named Inventor	Ted RAPPAPORT	
Art Unit		
Examiner Name		
Attorney Docket Number	08610001C10	

	20	8577300	B2	2013-11-05	Gossain et al.	
	21	8583157	B2	2013-11-12	Stanforth et al.	
	22	8644868	B2	2014-02-04	Gossain et al.	
	23	8700077	B2	2014-04-15	Schmidt et al.	
	24	8755830	B2	2014-06-17	Roberts et al.	
	25	8792901	B2	2014-07-29	Schmidt	
	26	8804680	B2	2014-08-12	Schmidt et al.	
	27	8824970	B2	2014-09-02	Schmidt et al.	
Change(s) applied to document, /J.G./ 7/21/2020	28	8831625	B2	2014-09-09	Joslyn et al. ~~Spectrum Bridge INC. et al.~~	
	29	8559891	B2	2013-10-15	Tang et al.	
	30	8509706	B2	2013-08-13	Tang et al.	

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

Application Number		
Filing Date		
First Named Inventor	Ted RAPPAPORT	
Art Unit		
Examiner Name		
Attorney Docket Number	08610001C10	

9	8249966	B2	2012-08-21	Stanforth et al.	
10	8279823	B2	2012-10-02	Stanforth et al.	
11	8290848	B2	2012-10-16	Duffus et al.	
12	8380194	B2	2013-02-19	Gossain et al.	
13	8406188	B2	2013-03-26	Schmidt et al.	
14	8457644	B2	2013-06-04	Schmidt et al.	
15	8504087	B2	2013-08-06	Stanforth et al.	
16	8521636	B2	2013-08-27	Chang et al.	
17	8526944	B2	2013-09-03	Gossain et al. ~~Spectrum Bridge INC.~~	
18	8532686	B2	2013-09-10	Schmidt et al.	
19	8576817	B2	2013-11-05	Stanforth et al.	

Change(s) applied
to document,
/J.G./
7/21/2020

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

Application Number

Filing Date

First Named Inventor

Ted RAPPAPORT

Art Unit

Examiner Name

Attorney Docket Number

08610001C10

U.S. PATENTS

Remove

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
Change(s) applied to document, /J.G./ 7/21/2020	1	7958041	B2	2011-06-07	Stanforth et al. ~~Spectrum Bridge INC.~~	
	2	8041627	B2	2011-10-18	Stanforth et al. ~~Spectrum Bridge INC.~~	
	3	8073458	B2	2011-12-06	Chang et al.	
	4	8139496	B2	2012-03-20	Stanforth et al.	
	5	8160599	B2	2012-04-12	Stanforth et al.	
	6	8175612	B2	2012-05-08	Palmer et al.	
	7	8233928	B2	2012-07-31	Stanforth et al.	
	8	8234208	B2	2012-07-31	Stanforth et al.	

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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

By fax, send to: (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)

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.

30743 7590 06/02/2020
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/250,099	01/17/2019	Theodore S. Rappaport	08610001C10	8679

TITLE OF INVENTION: BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	09/02/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
PATEL, CHANDRAHAS B	2464	370-252000

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 03-09 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 W&C IP
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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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 forms 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: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Michael E. Whitham/

Date 9/1/2020

Typed or printed name Michael E. Whitham

Registration No. 32635

Electronic Patent Application Fee Transmittal

Application Number:	16250099			
Filing Date:	17-Jan-2019			
Title of Invention:	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES			
First Named Inventor/Applicant Name:	Theodore S. Rappaport			
Filer:	Michael E. Whitham/Walter Richardson			
Attorney Docket Number:	08610001C10			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				500

Electronic Acknowledgement Receipt

EFS ID:	40437069
Application Number:	16250099
International Application Number:	
Confirmation Number:	8679
Title of Invention:	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES
First Named Inventor/Applicant Name:	Theodore S. Rappaport
Customer Number:	30743
Filer:	Michael E. Whitham/Walter Richardson
Filer Authorized By:	Michael E. Whitham
Attorney Docket Number:	08610001C10
Receipt Date:	01-SEP-2020
Filing Date:	17-JAN-2019
Time Stamp:	10:11:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 500
RAM confirmation Number	E202091A12081255
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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)	08610001C10_IF.pdf	85891	no	1
			e07cab3a95105277a1afe3b8dfc828a67872c43a		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30311	no	2
			0039b3b08dd5ce6e19e436fb1c27c6fe6dc a7e7e		
Warnings:					
Information:					
Total Files Size (in bytes):			116202		
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NOTICE OF ALLOWANCE AND FEE(S) DUE

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RESTON, VA 20190

EXAMINER	
PATEL, CHANDRAHAS B	
ART UNIT	PAPER NUMBER
2464	

DATE MAILED: 06/02/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/250,099	01/17/2019	Theodore S. Rappaport	08610001C10	8679

TITLE OF INVENTION: BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	09/02/2020

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

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.

30743 7590 06/02/2020
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/250,099	01/17/2019	Theodore S. Rappaport	08610001C10	8679

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APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	09/02/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
PATEL, CHANDRAHAS B	2464	370-252000

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 03-09 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,

1 _____

(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.

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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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 forms 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: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/250,099	01/17/2019	Theodore S. Rappaport	08610001C10	8679
30743	7590	06/02/2020	EXAMINER	
W&C IP 11491 SUNSET HILLS ROAD SUITE 340 RESTON, VA 20190			PATEL, CHANDRAHAS B	
			ART UNIT	PAPER NUMBER
			2464	

DATE MAILED: 06/02/2020

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B 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 30 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.

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. 16/250,099	Applicant(s) Rappaport, Theodore S.	
	Examiner CHANDRAHAS PATEL	Art Unit 2464	AIA (FITF) 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 4/29/2020.
☐ 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 66-82. 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: ____.

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 ____.	

/Chandrabhas B Patel/
Primary Examiner, Art Unit 2464

DETAILED ACTION

Allowable Subject Matter

Claims 66-82 are allowed.

The following is an examiner's statement of reasons for allowance:

Claims 66, 72, 78 and 81 were indicated as allowable claims and depended from claim 45. Claims 66, 72, 78, and 81 have been revised to independent form and include all of the limitations of base claim 45 making claims 66-82 allowable over prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHANDRAHAS PATEL whose telephone number is (571)270-1211. The examiner can normally be reached on Monday - Thursday 7:30 - 17:30.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Ngo can be reached on 571-272-3139. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Chandahas B Patel/
Primary Examiner, Art Unit 2464

Issue Classification 	Application/Control No. 16/250,099	Applicant(s)/Patent Under Reexamination Rappaport, Theodore S.	
	Examiner CHANDRAHAS PATEL	Art Unit 2464	

CPC						
Symbol					Type	Version
H04B	/	7	/	15542	F	2013-01-01
H04W	/	28	/	04	I	2013-01-01
H04B	/	1	/	719	I	2013-01-01
H04W	/	12	/	08	I	2013-01-01
H04B	/	7	/	15528	I	2013-01-01
H04W	/	88	/	04	I	2013-01-01
H04W	/	28	/	0236	I	2013-01-01
H04B	/	7	/	15521	I	2013-01-01
H04B	/	7	/	15557	I	2013-01-01
H04W	/	4	/	06	I	2013-01-01
H04W	/	24	/	08	I	2013-01-01
H04B	/	7	/	1555	I	2013-01-01
H04W	/	4	/	18	A	2013-01-01
H04W	/	16	/	14	A	2013-01-01
H04W	/	28	/	10	A	2013-01-01
H04W	/	12	/	12	A	2013-01-01
H04W	/	24	/	00	A	2013-01-01
H04W	/	12	/	00	A	2013-01-01
H04W	/	84	/	005	A	2013-01-01
H04W	/	84	/	18	A	2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version
/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/Chandrabhas B Patel/ Primary Examiner, Art Unit 2464	26 May 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	7	1

Issue Classification 	Application/Control No. 16/250,099	Applicant(s)/Patent Under Reexamination Rappaport, Theodore S.	
	Examiner CHANDRAHAS PATEL	Art Unit 2464	

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04B7/155	/	7	/	155
H04W28/04	/	28	/	04
H04B1/719	/	1	/	719
H04W12/08	/	12	/	08
H04W88/04	/	88	/	04
H04W28/02	/	28	/	02
H04W4/06	/	4	/	06
H04W24/08	/	24	/	08
H04W12/12	/	12	/	12

NON-CLAIMED				
H04W4/18	/	4	/	18
H04W16/14	/	16	/	14
H04W28/10	/	28	/	10
H04W24/00	/	24	/	00
H04W12/00	/	12	/	00
H04W84/00	/	84	/	00
H04W84/18	/	84	/	18

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/Chandrabhas B Patel/ Primary Examiner, Art Unit 2464	26 May 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	7	1

Issue Classification 	Application/Control No. 16/250,099	Applicant(s)/Patent Under Reexamination Rappaport, Theodore S.
	Examiner CHANDRAHAS PATEL	Art Unit 2464

☐ Claims renumbered in the same order as presented by applicant	☐ CPA	☒ T.D.	☐ R.1.47
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CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	66	10	75												
2	67	11	76												
3	68	12	77												
4	69	13	78												
5	70	14	79												
6	71	15	80												
7	72	16	81												
8	73	17	82												
9	74														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 17	
/Chandrabhas B Patel/ Primary Examiner, Art Unit 2464 (Primary Examiner) _____ (Date) _____		26 May 2020 (Date)	O.G. Print Claim(s) 7 O.G. Print Figure 1

Search Notes 	Application/Control No. 16/250,099	Applicant(s)/Patent Under Reexamination Rappaport, Theodore S.
	Examiner CHANDRAHAS PATEL	Art Unit 2464

CPC - Searched*		
Symbol	Date	Examiner
H04M 1/247, 1/72525, 1/72563	01/29/2020	CBP
H04W 8/205, 92/18	01/29/2020	CBP

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
NPL; IP.com	01/29/2020	CBP
EAST search	01/29/2020	CBP
Above updated	05/26/2020	CBP

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04B	7/15542, 1/719, 7/15521, 7/15528, 7/1555, 7/15557	05/26/2020	CBP
H04W	4/06, 12/08, 24/08, 28/0236, 28/04, 88/04	05/26/2020	CBP
US-PGPUB	Database Interference Search	05/26/2020	CBP

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EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1529	rappaport.in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L2	35	L1 and (wireless same receiver).clm.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L3	2166	h04m1/247.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L4	154	L3 and (receiver same signal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L5	8264	h04m1/72525.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L6	611	L5 and (receiver same signal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L7	9939	h04m1/72563.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	ON	2020/05/26 12:02

			DERWENT; IBM_TDB			
L8	689	L7 and (receiver same signal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L9	7857	h04w8/205.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L10	436	L9 and (receiver same signal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L11	14039	h04w92/18.cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L12	1447	L11 and (receiver same signal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L13	902	L11 and (receiver same signal same transmitter)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02
L14	672	bandwidth same ("100" near mhz) same ("500" near mhz)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/05/26 12:02

EAST Search History (Interference)

Def #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L15	52	h04w4/06.cpc. and mhz.clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:07
L16	90	h04w12/08.cpc. and mhz.clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:15
L17	162	h04w24/08.cpc. and mhz.clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:16
L18	21	h04w24/08.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:16
L20	18	h04w28/0236.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:17
L21	18	h04w28/04.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:17
L22	16	h04w88/04.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:18
L23	16	h04b7/15542.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:18
L24	22	h04b1/719.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:19
L26	16	h04b7/15521.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:19
L27	16	h04b7/15528.cpc. and (mhz same transmitter).clm.	US- PGPUB; USPAT	OR	ON	2020/05/26 13:20

L28	16	h04b7/1555.cpc. and (mhz same transmitter).clm.	US- PEPUB; USPAT	OR	ON	2020/05/26 13:20
L29	16	h04b7/15557.cpc. and (mhz same transmitter).clm.	US- PEPUB; USPAT	OR	ON	2020/05/26 13:20
L30	390	(mhz same transmitter and data).clm.	US-PEPUB	OR	ON	2020/05/26 13:21
L31	214	(mhz same transmitter and data same receiver).clm.	US-PEPUB	OR	ON	2020/05/26 13:21
L32	37	(mhz same transmitter and data same receiver same network).clm.	US-PEPUB	OR	ON	2020/05/26 13:21

5/26/2020 1:37:52 PM

C:\Users\cpatel1\Documents\EAST\Workspaces\16\16250099.wsp



United States Patent and Trademark Office

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Document Code:WFEE

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Sale Accounting Date:05/04/2020

Sale Item Reference Number
16250099

Effective Date
04/29/2020

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/250,099	01/17/2019	Theodore S. Rappaport	08610001C10

CONFIRMATION NO. 8679

POA ACCEPTANCE LETTER



30743
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

Date Mailed: 05/01/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/28/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/agizaw/

Application Number * 16/250,099 *	Application/Control No. 16/250,099	Applicant(s)/Patent under Reexamination Rappaport, Theodore S.	
	Examiner PATEL, CHANDRAHAS B	Art Unit 2464	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed: <u>29 April 2020</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/PAMELA A YOUNG/ Technology Center: PLRC Telephone: (571)272-3622

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/250,099	Filing Date 01/17/2019	☐ To be Mailed
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ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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), (l), 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 \$50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 = *		x \$230 =	
☐ 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)	RATE (\$)	ADDITIONAL FEE (\$)
AMENDMENT	04/29/2020		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	
	Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0	x \$50 = 0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 3	= 1	x \$230 = 230
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
TOTAL ADD'L FEE						230
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
TOTAL ADD'L FEE						
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/FREDERICK E BRISCOE/
*** 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.						

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.**

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REJECTION OVER A "PRIOR" PATENT**Docket Number (Optional)
08610001c10

In re Application of: Rappaport

Application No.: 16/250,099

Filed: January 17, 2019

For: BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES

The applicant, Theodore S. Rappaport, owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 10,224,999 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

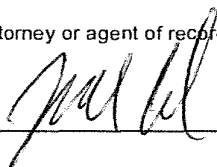
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 32,635



Signature

April 29, 2020
Date

Michael E. Whitham
Typed or printed name

Attorney of Record
Title

703-787-9400
Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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.

This collection of information is required by 37 CFR 1.321. 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.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Theodore Rappaport

Confirmation No. 8679

Serial No. 16/250,099

Group Art Unit 2464

Filed January 17, 2019

Examiner Patel

For BROADBAND REPEATER WITH SECURITY FOR
ULTRA WIDEBAND TECHNOLOGIES

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT UNDER 37. C.F.R. 1.111

Sir:

Solely for advancing the application to immediate allowance, please
amend the above-identified patent application as follows:

Amendments to the Specification: begin on page 2

Amendments to the Claims: begin on page 3

Remarks: begin on page 8

REMARKS

The specification has been amended to reference the priority information provided with the ADS when the application was filed. No new matter is presented.

Claims 45-65, and 83-84 have been cancelled. Claims 66, 72, 78, and 81 have been revised to independent form and include all of the limitations of base claim 45. The Commissioner is authorized to charge attorney's deposit account 50-2041 (W&C IP) for one additional independent claim.

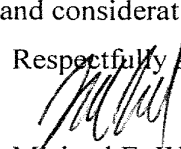
The office action identified claims 66, 72-78, and 81 as being directed to allowable subject matter. The applicant disputes the rejections made in the office action, and retains the right to pursue the canceled claims, or other claims supported by the patent specification in one or more continuing applications.

Furthermore, the applicant disputes any findings made by the Examiner concerning the anticipation of any of the claims by U.S. Patent 10,224,999. In order to address any possible position that the claims are not patentable due to obviousness-type double patenting, the applicant concurrently files herewith a terminal disclaimer. A copy of the power of attorney filed in this application on April 28, 2020 is also attached.

As only claims identified as being allowable, and claims made dependent thereon (e.g., claims 67-71 depend on allowable claim 66 remain in the application, claim 79 and 80 depend on allowable claim 78 remain in the application, and claim 82 which is dependent on allowable claim 81 remains in the application) reconsideration allowance of the application at an early date is requested.

Should extension of time be required to gain entry and consideration of this response, a provisional petition for an extension of time is hereby made. The Commissioner is authorized to charge attorney's deposit account 50-2041 (W&C IP for any fee required to gain entry and consideration of this response

Respectfully submitted,



Michael E. Whitham
Reg. No. 32,635

W&C IP
11491 Sunset Hills Road, Suite 340
Reston, VA 20190
Tel. (703) 787-9400
Fax. (703) 787-7557
Customer No.: 30743

Electronic Patent Application Fee Transmittal

Application Number:	16250099			
Filing Date:	17-Jan-2019			
Title of Invention:	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES			
First Named Inventor/Applicant Name:	Theodore S. Rappaport			
Filer:	Michael E. Whitham			
Attorney Docket Number:	08610001C10			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	160	160
Total in USD (\$)				160

Electronic Acknowledgement Receipt

EFS ID:	39303068
Application Number:	16250099
International Application Number:	
Confirmation Number:	8679
Title of Invention:	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES
First Named Inventor/Applicant Name:	Theodore S. Rappaport
Customer Number:	30743
Filer:	Michael E. Whitham
Filer Authorized By:	
Attorney Docket Number:	08610001C10
Receipt Date:	29-APR-2020
Filing Date:	17-JAN-2019
Time Stamp:	15:55:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
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RAM confirmation Number	E20204SF55451356
Deposit Account	
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		08610001c10_4_29_20.pdf	494385	yes	14
			ce634faef449bab1227dd2be6307b6c7b9f7f14a		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Terminal Disclaimer Filed		1	1	
	Amendment/Req. Reconsideration-After Non-Final Reject		2	2	
	Claims		3	8	
	Applicant Arguments/Remarks Made in an Amendment		9	10	
	Power of Attorney		11	14	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30455	no	2
			2db062ae9601c991793d0e4249af70747af6d3f4		
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Information:					
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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.

Amendments to the Specification

On page 1, please amend the paragraph on lines 6-10 as follows:

This application is a continuation application of USSN 15/627,903 filed June 20, 2017, which was a continuation of USSN 14/540,660 filed November 13, 2014, which was a continuation of USSN 13,676,245 filed November 14, 2012, which was a continuation of USSN 13/157789 filed June 10, 2011, which was a continuation of USSN 12/689052 filed January 18, 2010, which was a continuation of USSN 10/919,515 filed August 17, 2004, which claimed elaims priority to U.S. Provisional Application 60/496,913 filed Aug. 22, 2003, and U.S. Provisional Application 60/498,324 filed Aug. 28, 2003, and the complete contents of both applications is herein incorporated by reference.

Listing of the Claims:

The following is a complete listing of all the claims in the application, with an indication of the status of each:

1-65. (Cancelled)

66. (currently amended) A wireless network device, comprising:

a wireless transmitter that transmits wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

a wireless receiver that receives wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver;

wherein the wireless network device is configured for processing wireless data received by the wireless receiver, and

wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter.~~The wireless network device of claim 45~~

wherein the wireless network device is configured for transmitting beacon frames with the wireless transmitter.

67. (currently amended) The wireless network device of claim ~~66~~ 45 wherein the wireless transmitter is configured for transmitting wireless data at more than one data rate.

68. (currently amended) The wireless network device of claim ~~66~~ 45 wherein the wireless receiver is configured for receiving wireless data at more than one data rate.

69. (currently amended) The wireless network device of claim 66 45 wherein the wireless network device is configured to be powered through a connection to a DC power source.

70. (currently amended) The wireless network device of claim 66 45 wherein the wireless network device is configured to be powered through a connection to an AC power source.

71. (currently amended) The wireless network device of claim 66 45 wherein the wireless network device is configured to operate in a cellular network.

72. (currently amended) A wireless network device, comprising:

a wireless transmitter that transmits wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

a wireless receiver that receives wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver;

wherein the wireless network device is configured for processing wireless data received by the wireless receiver, and

wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter;

~~The wireless network device of claim 45 wherein the wireless network device comprises:~~

~~a wired connection port which permits a wired internet connection wherein the wireless network device is configured for transmitting and receiving wired data through the wired connection port;~~

wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from received wired data; and

wherein the wireless network device is configured for transmitting via the wired connection port wired data that contains information present in or determined from wireless data that has been received by the wireless receiver.

73. (previously presented) The wireless network device of claim 72 wherein the wireless network device is configured for processing received wired data and determining whether any, a portion, or all information in the processed wired data should be transmitted as wireless data to one or more other devices by the wireless transmitter.

74. (previously presented) The wireless network device of claim 72 wherein the wireless network device is configured for providing an internet connection to one or more other devices.

75. (previously presented) The wireless network device of claim 72 wherein the wired internet connection is an Ethernet connection.

76. (previously presented) The wireless network device of claim 72 wherein the wired internet connection is a coaxial connection.

77. (previously presented) The wireless network device of claim 72 wherein the wired internet connection is a wired optical cable connection.

78. (currently amended) A wireless network device, comprising:

a wireless transmitter that transmits wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

a wireless receiver that receives wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver;

wherein the wireless network device is configured for processing wireless data received by the wireless receiver,

wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter;

~~The wireless network device of claim 45~~

wherein the wireless transmitter is configured for transmitting wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz; and

wherein the wireless receiver is configured for receiving wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

79. (currently amended) The wireless network device of claim 78 45-wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 100 MHz.

80. (currently amended) The wireless network device of claim 78 45 wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 160 MHz.

81. (currently amended) A wireless network device, comprising:

a wireless transmitter that transmits wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

a wireless receiver that receives wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver;

wherein the wireless network device is configured for processing wireless data received by the wireless receiver,

wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter;

~~The wireless network device of claim 45~~

wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second; and

wherein the wireless receiver is configured for receiving wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second.

82. (currently amended) The wireless network device of claim 81 ~~45~~ wherein the wireless transmitter and the wireless receiver are both part of a transceiver.

83-84. (cancelled)

Acknowledgement Receipt

The USPTO has received your submission at **08:43:46** Eastern Time on **28-APR-2020**.

No fees have been paid for this submission. Please remember to pay any required fees on time to prevent abandonment of your application.

eFiled Application Information

EFS ID	39282380
Application Number	16250099
Confirmation Number	8679
Title	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES
First Named Inventor	Theodore S. Rappaport
Customer Number or Correspondence Address	30743
Filed By	Michael E. Whitham
Attorney Docket Number	08610001C10
Filing Date	17-JAN-2019
Receipt Date	28-APR-2020
Application Type	Utility under 35 USC 111 (a)

Application Details

Sequence	Submitted Files	Page Count	Document Description	File Size	Warnings
1	08610001c10_4_28_20.pdf	2	Power of Attorney	106351 bytes	◆ PASS

No validation errors found.

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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.

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- *For general questions regarding a petition, or requirements for filing a petition, contact the Office of Petitions Help Desk at 1 800-786-9199.*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Theodore Rappaport

Confirmation No. 8679

Serial No. 16/250,099

Group Art Unit 2464

Filed January 17, 2019

Examiner Patel

For BROADBAND REPEATER WITH SERCURITY FOR
ULTRAWIDEBAND TECHNOLOGIES

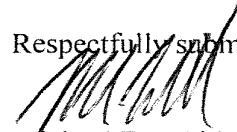
Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

SUBMISSION OF POWER OF ATTORNEY

Sir:

Attached hereto is a power of attorney for the undersigned to act in the
above-identified application

Respectfully submitted,



Michael E. Whitham
Reg. No. 32,635

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Doc Code: PA..
Document Description: Power of Attorney

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Application Number

Filing Date

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I am the Applicant (If the Applicant is a juristic entity, list the Applicant name in the box):

--

- ☒ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).		
Signature		
Name	Theodore S. Rappaport	Date (Optional)
Title		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Theodore Rappaport

Confirmation No. 8679

Serial No. 16/250,099

Group Art Unit 2464

Filed January 17, 2019

Examiner Patel

For BROADBAND REPEATER WITH SERCURITY FOR
ULTRA WIDEBAND TECHNOLOGIES

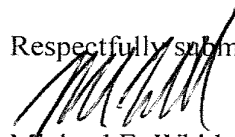
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Customer No.: 30743

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/B2B (07-13)
Approved for use through 11/30/2014. OMB 0051-0051
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Application Number

Filing Date

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I am the Applicant (If the Applicant is a juristic entity, list the Applicant name in the box):

- ☒ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.43(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Name

Theodore S. Kappanon

Date (Optional)

Title

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

- ☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.

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Electronic Acknowledgement Receipt

EFS ID:	39282380
Application Number:	16250099
International Application Number:	
Confirmation Number:	8679
Title of Invention:	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES
First Named Inventor/Applicant Name:	Theodore S. Rappaport
Customer Number:	30743
Filer:	Michael E. Whitham
Filer Authorized By:	
Attorney Docket Number:	08610001C10
Receipt Date:	28-APR-2020
Filing Date:	17-JAN-2019
Time Stamp:	08:43:46
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	Power of Attorney	08610001c10_4_28_20.pdf	106351	no	2
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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. <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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/250,099	01/17/2019	Theodore S. Rappaport	08610001C10	8679
30743	7590	01/30/2020		
W&C IP			EXAMINER	
11491 SUNSET HILLS ROAD			PATEL, CHANDRAHAS B	
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RESTON, VA 20190				
			ART UNIT	PAPER NUMBER
			2464	
			MAIL DATE	DELIVERY MODE
			01/30/2020	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.

DETAILED ACTION

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(I)(1) - 706.02(I)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-l.jsp.

Claims 45, 66, 72 and 73-78 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 32, 33 and 34-39 of U.S. Patent No. 10,224,999. Although the claims at issue are not identical, they are not patentably distinct from each other because claims 1, 32, 33 and 34-39 of the patent anticipate claims 45, 66, 72 and 73-78 of the present application. The table shown below shows mapping of the claims between the present application and the patent.

Present Application	UPSN 10,224,999
Claims 45 and 81	Claim 1
Claims 45 and 66	Claim 32
Claims 45 and 72	Claim 33
Claims 45, 72 and 73	Claim 34
Claims 45, 72 and 74	Claim 35
Claims 45, 72 and 75	Claim 36
Claims 45, 72 and 76	Claim 37

Claims 45, 72 and 77	Claim 38
Claims 45 and 78	Claim 39

Claim Rejections - 35 USC § 103

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

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, 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.

Claims 45-51, 54, 55, 57-60, 65, 67, 68, 70, 71, 79, 80 and 82-84 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Proctor, JR. et al. (US-PGPUB 2006/0063484) in view of Kintis et al. (USPN 6,301,465).

Regarding claim 45, Proctor, JR. teaches a wireless network device, comprising: a wireless transmitter that transmits wireless data through electromagnetic signals [Para 35, transmits signals]; a wireless receiver that receives wireless data through electromagnetic signals [Para 35, receives signals]; wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver [Para 21, receives and retransmits signals]; wherein the wireless network device is configured for processing wireless data received by the wireless receiver, and wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter [Para 21 and 35, receives and retransmits relevant portions of signals].

However, Proctor, JR. does not teach the electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

Kintis teaches the electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz [Col. 5, line 47 - Col. 6, line 14, processes signals between 100 MHz and 500 MHz].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to use signals having bandwidth between 100 MHz to 500 MHz in a system that receives and transmits signals so that data in multiple frequencies can be received and sent [Col. 5, line 47 - Col. 6, line 14].

Regarding claim 46, Proctor, JR. teaches the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted as wireless data to one or more other devices by the wireless transmitter [Para 21 and 35].

Regarding claims 47, 48 and 49, Proctor, JR. teaches the wireless network device is a wireless router, a wireless access point or a repeater [Fig. 1, 200].

Regarding claims 50 and 51, Proctor, JR. teaches the wireless transmitter is configured for transmitting and the wireless receiver is configured for receiving wireless data according to an 802.11 wireless standard [Abstract].

Regarding claim 54, Proctor, JR. teaches the wireless network device is configurable by an interface that is accessible from a computer [Fig. 1, 200].

Regarding claim 55, Proctor, JR. teaches two or more antennas [Para 36].

Regarding claim 57, Kintis teaches performing beamforming [Abstract].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to perform beamforming so that communication can be done using pre-defined bandwidth [Abstract].

Regarding claim 58-60, Proctor, JR. teaches an adaptable antenna, a steerable antenna and an omnidirectional antenna [Para 36].

However, Proctor, JR. does not teach using the an adaptable antenna, a steerable antenna and an omnidirectional antenna for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

Kintis teaches using the an adaptable antenna, a steerable antenna and an omnidirectional antenna for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz [Col. 5, line 47 - Col. 6, line 14, processes signals between 100 MHz and 500 MHz].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to use signals having bandwidth between 100 MHz to 500 MHz in a system that receives and transmits signals so that data in multiple frequencies can be received and sent [Col. 5, line 47 - Col. 6, line 14].

Regarding claim 65, Proctor, JR. teaches transmitting wireless data through electromagnetic signals in more than one frequency band, and wherein the wireless receiver is configured for receiving wireless data through electromagnetic signals in more than one frequency band [Para 21 and 22].

Regarding claims 67 and 68, Proctor, JR. teaches transmitting and receiving wireless data at more than one data rate [Para 21 and 22].

Regarding claim 70, Proctor, JR. teaches the wireless network device is configured to be powered through a connection to an AC power source [Para 21].

Regarding claim 71, Proctor, JR. teaches the wireless network device is configured to operate in a cellular network [Para 49].

Regarding claims 79 and 80, Kintis teaches transmitting wireless data through electromagnetic signals that have a bandwidth of 100 MHz and 160 MHz [Col. 5, line 47 - Col. 6, line 8].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to transmit data on 100 MHz and 160 MHz signal since this is a configurable parameter specific to a device [Col. 5, line 47 - Col. 6, line 8].

Regarding claim 82, Proctor, JR. teaches the wireless transmitter and the wireless receiver are both part of a transceiver [Fig. 2, 305].

Regarding claim 83, Proctor, JR. teaches a wireless network system, comprising: one or more wireless network devices as recited in claim 45 [Fig. 1, 200]; and one or more devices which receive wireless data transmitted by the wireless transmitter of at least one of the one or more wireless network devices [Fig. 1, 105].

Regarding claim 84, Proctor, JR. teaches a wireless networking method [Abstract], comprising: transmitting wireless data through electromagnetic signals with a wireless transmitter that is part of or in communication with a wireless network device [Para 35]; receiving wireless data through electromagnetic signals with a wireless receiver that is part of

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or in communication with the wireless network device [Para 35]; processing wireless data received by the wireless receiver with a processor that is part of or in communication with the wireless network device [Para 21]; and determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter, wherein the wireless data transmitted in the transmitting step contains information present in or determined from wireless data that was received by the wireless receiver in the receiving step [Para 21 and 35].

However, Proctor, JR. does not teach the electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

Kintis teaches the electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz [Col. 5, line 47 - Col. 6, line 14, processes signals between 100 MHz and 500 MHz].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to use signals having bandwidth between 100 MHz to 500 MHz in a system that receives and transmits signals so that data in multiple frequencies can be received and sent [Col. 5, line 47 - Col. 6, line 14].

Claims 52 and 53 rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Proctor, JR. et al. (US-PGPUB 2006/0063484) in view of Kintis et al. (USPN 6,301,465) as applied to claim 45 above, and further in view of Sutton et al. (USPN 6,915,112).

Regarding claim 52, the references teach a wireless network device as discussed in rejection of claim 45.

However, the references do not teach the wireless transmitter is configured for transmitting half duplex wireless data and wherein the wireless receiver is configured for receiving half duplex wireless data.

Sutton teaches the wireless transmitter is configured for transmitting half duplex wireless data and wherein the wireless receiver is configured for receiving half duplex wireless data [Col. 4, lines 44-49].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to use half duplex communication so that noise can be isolated [Col. 1, lines 52-60].

Regarding claim 53, the references teach a wireless network device as discussed in rejection of claim 45.

However, the references do not teach the wireless transmitter is configured for transmitting full duplex wireless data and wherein the wireless receiver is configured for receiving full duplex wireless data.

Sutton teaches the wireless transmitter is configured for transmitting full duplex wireless data and wherein the wireless receiver is configured for receiving full duplex wireless data [Col. 4, lines 44-49].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to use full duplex communication so that simultaneous transmission and reception of signals can be done [Col. 2, lines 3-9].

Claims 56, 63, 64 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Proctor, JR. et al. (US-PGPUB 2006/0063484) in view of Kintis et al. (USPN 6,301,465) as applied to claim 55 above, and further in view of Jalali et al. (USPN 6,952,454).

Regarding claim 56, the references teach a wireless network device as discussed in rejection of claim 55.

However, the references do not teach using MIMO antenna technology.

Jalali teaches using MIMO antenna technology [Fig. 1].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to MIMO antenna technology so that performance improvement can be achieved [Col. 5, lines 20-40].

Regarding claim 63, the references teach a wireless network device as discussed in rejection of claim 45.

However, the references do not teach assigning priority levels to at least some wireless data that is to be transmitted by the wireless transmitter.

Jalali teaches assigning priority levels to at least some wireless data that is to be transmitted by the wireless transmitter [Col. 26, lines 18-26].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to assign priority level to some wireless data in a single transmission can be given different priority levels [Col. 26, lines 18-26].

Regarding claim 64, the references teach a wireless network device as discussed in rejection of claim 45.

However, the references do not teach assigning one or more priority levels to at least some wireless data that is to be transmitted by the wireless transmitter, wherein at least some of the one or more priority levels are related to one or more levels of a certain quality of service.

Jalali teaches assigning one or more priority levels to at least some wireless data that is to be transmitted by the wireless transmitter, wherein at least some of the one or more priority levels are related to one or more levels of a certain quality of service [Col. 26, lines 18-26].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to assign priority level to some wireless data in a single transmission can be given different priority levels [Col. 26, lines 18-26].

Claim 61 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Proctor, JR. et al. (US-PGPUB 2006/0063484) in view of Kintis et al. (USPN 6,301,465) as applied to claim 45 above, and further in view of Ohkura et al. (US-PGPUB 2001/0018328).

Regarding claim 61, the references teach a wireless network device as discussed in rejection of claim 45.

However, the references do not teach the devices is configured for operating within a wireless mesh network.

Ohkura teaches the devices is configured for operating within a wireless mesh network [Para 106].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have the device in a mesh network so that mutual data communication can be done by network nodes [Para 107].

Claim 62 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Proctor, JR. et al. (US-PGPUB 2006/0063484) in view of Kintis et al. (USPN 6,301,465) as applied to claim 45 above, and further in view of Perlman (US-PGPUB 2004/0160928).

Regarding claim 62, the references teach a wireless network device as discussed in rejection of claim 45.

However, the references do not teach using data encryption when transmitting with the wireless transmitter.

Perlman teaches using data encryption when transmitting with the wireless transmitter [Para 103].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to encrypt data so that data privacy can be maintained [Para 100].

Claim 69 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Proctor, JR. et al. (US-PGPUB 2006/0063484) in view of Kintis et al. (USPN 6,301,465) as applied to claim 45 above, and further in view of King (US-PGPUB 2005/0025085).

Regarding claim 69, the references teach a wireless network device as discussed in rejection of claim 45.

However, the references do not teach the wireless network device is configured to be powered through a connection to a DC power source.

King teaches the wireless network device is configured to be powered through a connection to a DC power source [Para 41].

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to power using DC power source so that repeater can be powered [Para 41].

Allowable Subject Matter

Claims 66, 72-78 and 81 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHANDRAHAS PATEL whose telephone number is (571)270-1211. The examiner can normally be reached on Monday - Thursday 7:30 - 17:30.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Ngo can be reached on 571-272-3139. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2464

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

/Chandahas B Patel/
Primary Examiner, Art Unit 2464

<i>Notice of References Cited</i>	Application/Control No. 16/250,099		Applicant(s)/Patent Under Reexamination Rappaport, Theodore S.	
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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-7365527-B2	04-2008	Sullivan; Mark	G01R23/14	324/76.19
	B					
	C					
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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
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NON-PATENT DOCUMENTS

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*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.

<i>Search Notes</i> 	Application/Control No. 16/250,099	Applicant(s)/Patent Under Reexamination Rappaport, Theodore S.
	Examiner CHANDRAHAS PATEL	Art Unit 2464

CPC - Searched*		
Symbol	Date	Examiner
H04M 1/247, 1/72525, 1/72563	01/29/2020	CBP
H04W 8/205, 92/18	01/29/2020	CBP

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
NPL; IP.com	01/29/2020	CBP
EAST search	01/29/2020	CBP

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	01/29/2020								
	45	✓								
	46	✓								
	47	✓								
	48	✓								
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	81	○								
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	84	✓								

Bibliographic Data

Application No: 16/250,099

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /Chandrabhas B Patel/

CBP

Examiner's Signature

Initials

Title:

BROADBAND REPEATER WITH SECURITY FOR
ULTRAWIDEBAND TECHNOLOGIES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/17/2019	370	2464	08610001C10
RULE			

APPLICANTS

INVENTORS

Theodore S. Rappaport Riner, VA, UNITED STATES

CONTINUING DATA

This application is a CON of 15627903 06/20/2017 PAT 10224999

15627903 is a CON of 14540660 11/13/2014 PAT 9722690

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FOREIGN APPLICATIONS

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1497	rappaport.in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/28 12:47
S2	35	S1 and (wireless same receiver).clm.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/28 12:48
S3	482	("20010018328" "20020044042" "20020072357" "20020093928" "20020111137" "20020142767" "20020188530" "20020197990" "20020198977" "20030053521" "20030063597" "20030096578" "20030110157" "20030124976" "20030162504" "20030162528" "20030211828" "20030220075" "20040010605" "20040017306" "20040095907" "20040142680" "20040146092" "20040157550" "20040160928" "20040166802" "20040178928" "20040178942" "20040190594" "20040198260" "20040212537" "20040217909" "20040259494" "20040264403" "20050018640" "20050025085" "20050026563" "20050026661" "20050197121" "20050208889" "20060063484" "20060071776" "20060084395" "20060106961" "20060251148" "20060285577" "20070247385" "20080065416" "20080107162" "20080136644" "20080242349" "20080318619" "20090295648" "20100060531" "20120033714" "4298179" "4626845" "4659878" "4932049" "5012211" "5086506" "5293375" "5592491" "5633876" "5634196" "5754540" "5818821" "5844905" "5898382" "5974236" "6054950" "6110221" "6186908" "6272640" "6292475" "6301465" "6348986"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/28 13:09

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S4	2147	h04m1/247.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 10:25
S5	153	S4 and (receiver same signal)	US- PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 10:25
S6	8100	h04m1/72525.cpc.	US- PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 11:38
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S13	1373	S12 and (receiver same signal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 11:48
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1/29/2020 12:05:18 PM
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number

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First Named Inventor

Ted RAPPAPORT

Art Unit

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Attorney Docket Number

08610001C10

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Examiner Name		
Attorney Docket Number	08610001C10	

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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	2476773	GB	A	2011-07-06	Spectrum Bridge INC.		
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Application Number	
Filing Date	
First Named Inventor	Ted RAPPAPORT
Art Unit	
Examiner Name	
Attorney Docket Number	08610001C10

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	E. H. DRUCKER, "Development and Application of a Cellular Repeater," Proceedings of IEEE Vehicular Technology Conference, June 1988, pages 321-325.	
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Examiner Name		
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Examiner Signature	/Chandrabhas B Patel/	Date Considered	01/29/2020
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PLUS Search Results for S/N 16250099, Searched Wed Jul 17 07:00:49 EDT 2019

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/250,099	01/17/2019	Theodore S. Rappaport	08610001C10

CONFIRMATION NO. 8679

PUBLICATION NOTICE



OC000000108239765

30743
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

Title:BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES

Publication No.US-2019-0149223-A1

Publication Date:05/16/2019

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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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/250,099	01/17/2019	2649	1785	08610001C10	40	2

CONFIRMATION NO. 8679

FILING RECEIPT



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30743
W&C IP
11491 SUNSET HILLS ROAD
SUITE 340
RESTON, VA 20190

Date Mailed: 02/08/2019

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Inventor(s)

Theodore S. Rappaport, Riner, VA;

Applicant(s)

Theodore S. Rappaport, Riner, VA;

Power of Attorney: The patent practitioners associated with Customer Number 30743

Domestic Priority data as claimed by applicant

This application is a CON of 15/627,903 06/20/2017
which is a CON of 14/540,660 11/13/2014 PAT 9722690
which is a CON of 13/676,246 11/14/2012 PAT 8918049
which is a CON of 13/157,789 06/10/2011 PAT 8331854
which is a CON of 12/689,052 01/18/2010 PAT 7983613
which is a CON of 10/919,515 08/17/2004 PAT 7676194
which claims benefit of 60/498,324 08/28/2003
and claims benefit of 60/496,913 08/22/2003

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/250,099**

Projected Publication Date: 05/16/2019

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES

Preliminary Class

455

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/250,099				
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	75		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	330		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A				
TOTAL CLAIMS (37 CFR 1.16(j))	40 minus 20 =	*	x 50 =	1000	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x 230 =	0.00						
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).			0.00						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00						
			TOTAL	1785		TOTAL				
* 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		OR OTHER THAN SMALL ENTITY		
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 =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
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 =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	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 found in the appropriate box in column 1.										

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	Filing Date		
	First Named Inventor	Ted RAPPAPORT	
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	Attorney Docket Number	08610001C10	

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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	7958041	B2	2011-06-07	Spectrum Bridge INC.	
	2	8041627	B2	2011-10-18	Spectrum Bridge INC.	
	3	8073458	B2	2011-12-06	Chang et al.	
	4	8139496	B2	2012-03-20	Stanforth et al.	
	5	8160599	B2	2012-04-12	Stanforth et al.	
	6	8175612	B2	2012-05-08	Palmer et al.	
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9	8249966	B2	2012-08-21	Stanforth et al.	
10	8279823	B2	2012-10-02	Stanforth et al.	
11	8290848	B2	2012-10-16	Duffus et al.	
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17	8526944	B2	2013-09-03	Spectrum Bridge INC.	
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19	8576817	B2	2013-11-05	Stanforth et al.	

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Attorney Docket Number	08610001C10	

20	8577300	B2	2013-11-05	Gossain et al.	
21	8583157	B2	2013-11-12	Stanforth et al.	
22	8644868	B2	2014-02-04	Gossain et al.	
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29	8559891	B2	2013-10-15	Tang et al.	
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Art Unit		
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40	4298179	A	1981-11-03	American Standard INC.	
41	6952456	B1	2005-10-04	Pulse Link INC.	

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42	7787513	B2	2010-08-31	Siwiak et al.	
43	6806821	B2	2004-10-19	McLemore	
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45	6754882	B1	2004-06-22	XILINX INC.	
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Examiner Name		
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Attorney Docket Number	08610001C10	

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Name/Print	Michael E. Whitham	Registration Number	32635

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First Named Inventor/Applicant Name:	Theodore Rappaport			
Filer:	Michael E. Whitham/Walter Richardson			
Attorney Docket Number:	08610001C10			
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Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
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Claims:				
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Miscellaneous-Filing:				
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Application Number:	16250099
International Application Number:	
Confirmation Number:	8679
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First Named Inventor/Applicant Name:	Theodore Rappaport
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BROADBAND REPEATER WITH SECURITY FOR
ULTRAWIDEBAND TECHNOLOGIES

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application claims priority to U.S. Provisional
Application 60/496,913 filed August 22, 2003, and U.S.
Provisional Application 60/498,324 filed August 28, 2003, and
the complete contents of both applications is herein
10 incorporated by reference.

DESCRIPTION

BACKGROUND OF THE INVENTION

15

Field of the Invention

The present invention generally relates to electronic
signal and data repeaters and, more particularly, to a repeater
20 to be used in conjunction with ultrawideband technologies.

Background Description

In the coming years, ultrawideband (UWB) transmission
25 technologies will dominate high data rate communications in the
last 10 - 1000 meters of wireless/portable access to a
telecommunications grid. With the huge data rates and position
location capabilities afforded by UWB, offices, homes, and
small environments such as doctors offices, vehicles, or small
30 buildings will rely on UWB communication devices for
connections between consumer electronic devices and computer
devices.

As UWB devices proliferate, it will be possible to
provide immense data rates, at burst rates up to 480 Megabits
35 per second and even greater, in order to create a wireless
Universal Serial Bus (USB) capability or home/enterprise
networking capability. This will allow cameras, cellphones,
computers, and computer and home entertainment and video

systems to have very good and fast data rate transmissions in small (say 10 to 50 feet or greater) distances. The great data rates of UWB will open up an entire new world of high speed personal area networks which currently does not exist.

5 Companies such as Time Domain, Xtreme Spectrum Inc, Motorola, Intel and Texas Instruments, are likely to be leading manufacturers or developers of products for UWB communications.

In typical doctors offices, homes, apartment buildings, and large warehouses and store rooms, etc, today there are
10 Wireless (WiFi) access points that can be connected to the ethernet backbone in order to provide WLAN access and internet access to computer platforms. The backbone medium is typically Cat-3 or Cat-5 cabling that has 10baseT, 100baseT or 1 GHz ethernet signaling, and higher. In the future, this backbone
15 may be wireless, for example, where cable companies or telephone/wireless/internet service providers may use mesh networks, WiMax, or last mile MIMO modem devices that bring broadband video, audio, and data/internet traffic to homes from lampposts or street corners. Satellite radio and fiber cable
20 are also viable methods of delivering the backbone plant to buildings and cars.

Today, the expense of the WiFi access points is on the order of one to several hundred dollars when the hardware and installation is factored in. These access points provide the
25 ability of multiple WLAN users (typically computer or PDA users) to gain portable access the internet, and hot spots such as those implemented by Schlotzskys Deli and Starbucks are becoming popular throughout the world. However, these WiFi access points are made to allow users to access the internet,
30 which is a different use and approach than is likely to emerge with UWB networks, which connect devices together in close-in

networks.

Ultrawideband technologies are about to become mainstream, and are described in US patent application 20030096578, published May 22, 2003, by John McCorkle, et. al. of Xtreme Spectrum, Inc., US Patent 6,505,032 (the patent publication and U.S. patent being herein incorporated by reference), as well as in "Recent Applications of Ultra Wideband Radar and Communications Systems", by Robert Fonatna of Multispectral Solutions, Inc. The IEEE 802.15.3 standards bodies have been developing Physical (PHY) and MAC layer standards for dynamic channel selection and repeater service for UWB, which falls under the general IEEE 802.15.3 standards body.

As explained in the powerpoint presentation by Nishant Kumar, of Virginia Tech's MPRG, as well as in the IEEE standards proceedings, the IEEE 802.15.3 MAC operation provides for repeater service request and repeater service grant commands. Devices use passive scanning to listen for beacon frames or for any nearby user device. If there are not nearby devices which are radiating, a device may establish its own piconet. There are a number of frame and superframe structures, and subsections which permit various types of access, such as contention based schemes using, for example, carrier sense multiple access (CSMA), as well as guaranteed time slots for asynchronous or isochronous data streams and management time slots.

While the MAC standard suggests repeater service to be used by IEEE 802.15.3 devices when the links between devices are not satisfactory, these types of links can only be established if there is sufficient time available in the channel seen by one of the devices which is involved in the

repeating operation. As proliferation of UWB devices is likely to be rapid, there is likely to be contention such that the current mode of MAC repeater operation, envisioned by the presently proposed 802.15.3 standard, is not adequate to
5 provide one or more of sufficient security, proper traffic filtering, bandwidth provisioning, network management features, or flexibility of networks that can be installed or controlled easily by a consumer. That is to say, the current repeater operation contemplated by 802.15.3 and proposed UWB devices is
10 based on the assumption that a single chip can perform necessary repeater functions, but this functionality alone will not be adequate for the rapid emergence of UWB and the onslaught of wireless data that is certain to occur.

Currently, IEEE 802.15.3a , the Ultrawideband Physical
15 Layer standard committee, is working on creating a standard that may either be Multiband OFDM transmission (MBOA), with 500 MHz channels, or a Direct Sequence Spread Spectrum impulse radio standard that has broader channel bandwidths (UWB Forum). Ratification of one or both of these standards may
20 occur by the end of 2004, as described in a recent paper submitted to High Frequency Electronics, coauthored by the present inventor.

The High-Tech article by Woz Ahmed and Bipin Parmar (the Chilli) provides a glimpse at the various activities in the
25 Ultrawideband standard bodies. Ultra-Wideband Technology was also discussed in the New Technology Bulletin in March 2001, Vol. 1, Issue 7, before the multiband OFDM proposal was created. In fact, Time Domain's Paul Withington presented the talk "Time Modulated Ultra-Wideband" to the Federal Wireless
30 User's Forum in May 2001. As described by Robert X. Cringely in his August 8, 2002 article, "Good News!", it was mentioned that

Xtreme Spectrum had already produced a working UWB chip capable of 100 megabits per second over 10 meters, and the article further explained the idea of mesh networking, which will provide efficient network paths that allow very high data rates across the internet for remote downloading of files.

In "Ultrawideband.ca Mesh Networking Explained", Ultrawideband.ca explains they have software that allows a user to install, on their PC, a MeshBoot disk which attempts to find internet gateways at particular Internet Protocol addresses using a DHCP client. If no gateway can be found, the software causes the users' PC to simply serve as a wireless repeater-cell. This type of operation is controlled by the software on the CD, and requires installation by the user. In future years, there are parallels that can be drawn between some of the features and functionality in the MeshBoot software for Internet use, and the capabilities that will be required to be embedded in network hardware, rather than provided on a CD for installation on PCs, in order to support massive amounts of traffic in and around homes and offices (Rather than on the world-wide web or internet).

Repeaters are well known in the art, and they have been manufactured for decades in the cellular and PCS industries, and more recently, a company in Melbourne FL, WiDeFi has developed WiFi repeaters for the IEEE 802.11a/b marketplace (See WiDeFi web pages describing their patent pending designs for range and bridge extension for Wireless LAN standards). Buffalo Technology announced a bridge and repeater product for IEEE 802.11g wireless LAN WiFi standard on June 17, 2003 (See SmallNet Builder website page), and indicated that its repeater provides point-to-point or 6 station point-to-multi-point operation. Buffalo indicated it had security features such as WiFi Protected Access (WPA), WEP, Password protection, and MAC address association control. It uses a browser based interface

for configuration, and has a 10/100 Ethernet LAN connection port, and sells for the suggested price of \$149. SMC Networks introduced, on June 6, 2003, its SMC2671W 2.4 GHz 11 Mbps Wireless Ethernet Adapter, which provides an interface between the wired internet backbone and the wireless LAN network. It also has wireless repeater capabilities for WLAN range extension, and has both Ad-Hoc (peer-to-peer) and Infrastructure (client to AP) operating modes, WEP encryption, WPA, MAC Address filtering, and SSID Broadcast Disable. It uses a web browser or Window-based administration software for configuration. Andrew Corporation makes classic PCS/Cellular repeaters, such as the fully integrated PROPAGATOR repeater shown on its webpage. The repeater uses standard 110VAC power and has a single package for all signal processing components. Qualcomm has recently developed repeater technology for CDMA.

SUMMARY OF THE INVENTION

This document describes a new type of wireless network device that will be required as wideband UWB devices proliferate rapidly. In anticipation of the increased traffic, ubiquity, security and bandwidth provisioning needs of future UWB devices, we disclose a low cost repeater/transceiver that is tailored for easy and rapid deployment to facilitate the interconnection of network devices using ultrawideband radio, which will likely be standardized by or before 2005. Ultrawideband is meant here to be any type of electromagnetic signals that have an instantaneous or overall occupied bandwidth of 100 MHz or more and that are used to communicate or to position-locate between 2 or more devices. Such wide bandwidths, when considered to have the same RF power transmitter levels as today's wireless devices, require receivers to be within much closer propagation distances than conventional cellular/PCS and WiFi networks, due to the fundamentals of the Power-Bandwidth product. That is, for a given RF transmit power level, a larger passband (e.g. RF

channel) bandwidth generally implies a proportionally higher noise floor power level, which requires UWB devices generally to be physically closer in distant to each other in order to obtain a sufficiently strong signal to noise ratio (SNR) when
5 compared to equal power devices with smaller passband bandwidths. Thus, repeaters will become necessary to connect devices over greater distances than the range of a single UWB device.

10 UWB adoption is likely to be rapid, and just as spam e-mail occurs today with increased frequency on the internet, wireless UWB devices will be subject to tremendous and increased amount of interference, spam traffic, and RF interferences, as well as security attacks by rouge or spoofed
15 message sources or unwanted transmitters. Proper repeater functionality will require the ability to detect and process such unwanted traffic in a personal or local area network, as well as to report back attempted breaches of security or interference sources to a network controller or host device
20 which is connected to the internet (for example, the home computer, the media center, game console, or a remotely located server or security server that may be in a different neighborhood or city but which is connected via Internet). The need to properly process, filter, ensure security, and provide
25 sufficient or prioritized bandwidth will also emerge because of - future wireless networks that will allow devices in the home or office to remain connected to the outdoor wireless network through roaming systems and protocols, as proposed by Dong-Ho Cho in US Patent Application 2002 0198977 Published December
30 26, 2002, and other networks such as those described by Rappaport in "Wireless Communications: Principles and Practice", 2/e, c. 2002 and the invited 50th anniversary paper by Rappaport, et. al., Wireless Communications: Past Events and

Future Perspectives, June 2002, IEEE Communications Magazine.

In future UWB applications in the home or office, it is likely that only one or two devices, such as a computer, a server, or a television set or game console, will need to be
5 connected to the ethernet/internet backbone (the plant that comes in to the home or office or car, etc.), while many other devices, such as home entertainment systems, telephones, portable computers, video monitors, and
display/video/audio/entertainment devices in the home or office
10 will be untethered within the same room or within several tens of meters of these "fixed" or stationary internet-connected devices. Of course, these fixed devices connected to the plant may also be portable or mobile, in fact, as wireless proliferates. In hospitals, hotels, or homes and offices and
15 businesses, the UWB technologies will open up an entirely new way of communicating high data rates, and will create entirely new architectures for communications within small spaces (e.g, homes, apartment buildings, cars, stores, offices, etc.). In vehicles, trains, aircraft, and other moving platforms, one can
20 envision a single or a few main devices connected to an outside wireless internet connection, while in the vehicle itself, piconets will be formed between UWB devices.

The invention described here is a low cost ultrawideband repeater device, which allows a home or office user to rapidly
25 deploy a repeater which can extend the range of these UWB piconets, so that a home or business owner does not have to install wiring such as Cat -5 cable throughout an office or home. Instead of wires which carry the internet traffic from today's cable or T1 or DSL jack to a particular device, the UWB
30 repeater invented here will allow just one or a handful of internet-connected devices to serve as the "internet source"

for a local wireless network, and the disclosed invention will better enable that "source" to serve as the local hub or access point for a whole host of portable or fixed UWB devices in a home or office.

5 It is thus the goals of the present invention to meet at least some or all of the following objectives, which are specified subsequently in this application:

 It is an object of the invention to provide a method and system that allows the Internet, Cable TV, satellite,
10 telephone, or other communications sources to be connected from the external wired or wireless plant and distributed by UWB radio within an indoor or in-vehicle environment.

 It is yet another object of the invention to provide a method and system that enables ultrawideband radio signals to
15 be repeated by a UWB radio device within an indoor or in-vehicle environment.

 It is yet another object of the invention to provide a method and system that enables ultrawideband radio signals and baseband signals carried on wires to be connected together in a
20 single device, while allowing UWB radio signals to be repeated in the RF spectrum and baseband signals to be routed on wires within an indoor or in-vehicle environment.

- It is yet another object of the invention to provide a method and system that provides the selective screening of data
25 received over UWB radio or baseband, where such selective screening of data is based upon the received UWB data or upon preprogrammed control instructions provided by the desired network or from a desired source.

It is yet another object of the invention to provide a method and system that provides the selective screening of data received over UWB radio or baseband, where such selective screening of data is based upon the received UWB data or upon
5 preprogrammed control instructions provided by the desired network or from a desired source.

It is yet another object of the invention to provide a method and system that provides the selective screening of data received over UWB radio or baseband, where such selective
10 screening of data ignores, rejects, or kills received UWB data that is from undesired networks or from undesired sources.

It is yet another object of the invention to provide a method and system that provides the selective modification of data received over UWB radio or baseband, and provides said
15 modified data for retransmission on UWB radio frequencies, or for storage.

It is yet another object of the invention to provide a method and system that ignores, rejects, or kills received UWB data that is from undesired networks or from undesired sources.

20 It is yet another object of the invention to provide a method and system that provides selective and adaptive priorities on UWB messages that are to be repeated or stored.

It is yet another object of the invention to provide a method and system of monitoring network traffic statistics over
25 a UWB network, and to report such statistics to a central host - controlling unit or to the plant.

It is yet another object of the invention to provide a method and system of maintaining a UWB network, through the periodic reporting of traffic conditions, user numbers, user
30 locations, statistics, interference levels, and IDs observed.

It is yet another object of the invention to provide a method and system that provides for flexible and adaptive data processing for real time detection, flexible transmission rates, different PHY and MAC implementations, adaptive ID or

watermark transmissions, transmissions pertaining to network quality, network activity, or security breaches, position location transmissions, or repeat or beacon transmission at preset intervals.

5 It is yet another object of the invention to provide a method and system that provides an adaptive UWB radio interface, depending on the priority of the message, or the instantaneous radio channel conditions, interference conditions, or undesired traffic in the network.

10 It is yet another object of the invention to provide a method and system that provides for the use of adaptable, steerable, electronic phasing, or MIMO (multiple-input multiple-output) antennas with UWB networks to improve wireless network performance.

15 BRIEF DESCRIPTION OF THE DRAWINGS

 The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of the preferred embodiments of the invention with
20 reference to the drawings, in which:

 Figure 1 illustrates a Personal Area Network in a home, business, vehicle, or some other personal environment consisting of a host device and a number of portable devices,
25 each equipped with UWB technology.

 Figure 2 illustrates a Personal Area Network in a close-in space, consisting of a host device, a number of portable devices, all equipped with UWB technology, and the disclosed UWB repeater invention, as well as an undesired neighboring
30 transmitter.

 Figure 3 illustrates a block diagram of the UWB repeater.

Figure 4 illustrates another embodiment of the UWB repeater, using a more integrated approach with more reliance upon signal processing and software.

Figure 5 illustrates an architectural diagram of the UWB
5 repeater operation with security and filtering.

Figure 6 illustrates the UWB repeater using combined RF and baseband signaling capabilities.

Figure 7 illustrates a flow diagram of UWB repeater processing.

10 Figure 8 illustrates the current invention as embedded in an AC outlet.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

15 The Ultrawideband repeater disclosed here serves to "repeat" data signals coming from one or many devices so that other devices, located farther away from the "source" will be able to access the internet, Cable TV, Satellite source,
20 phone/DSL line, or other broadband "plant" source via the repeater. This will obviate the need for any wiring whatsoever in homes and offices, and will enable rapid deployment of networks that perform properly and adapt to traffic loading, spam, interference, and desired characteristics of the plant
25 provider of the network owner (e.g. home owner, enterprise owner, vehicle owner). The repeater will provide for additional coverage and will enable high data rate channels to work in confined environments more efficiently and more reliably than stock UWB equipment currently being offered by the marketplace.
30 The invention here offers advantages, flexibility, and improved performance and security than the currently proposed IEEE 802.15.3 activities which call for "repeater service" as part of the MAC definition.

The disclosed Ultrawideband repeater has the additional important and novel capabilities of being able to filter and process data, and to provide for the storage, processing, and forwarding of received data at the input, and also allows for the suppression or "killing" of data that is not part of the desired network or which may be from undesired users, spammers, or interference sources. Also, the ability of the device to prioritize traffic access and flows, based on application requirements, make this invention a powerful device used to enable high bandwidth personal area networks, where a number of wireless devices in a home or office or car all share the same UWB spectrum without requiring wiring, but which may have different real time requirements, different priorities and bandwidth requirements, and different security requirements. Thus, the intelligence of the repeater, afforded by processing, storage, and antenna/RF control is a marked improvement over what is currently contemplated or known.

The invention differs from prior art because, among a number of reasons, of the much greater bandwidth of UWB compared with current wireless devices, and the presently unforeseen challenges and unmet solutions that UWB will encounter because of the massive amounts of wireless traffic that will occur. The invented repeater and associated architecture solves a critical and unmet need for future high speed UWB networks, and provides needed network coverage, performance, security, filtering, addressability, configuration, and connectivity for a home or business or vehicle personal area network. The invention provides needed network infrastructure to provide coverage where only one or a few sources can be linked to the ethernet or another telecommunications backbone (e.g., a central server/hub, or a "plant", which may be an optical cable source, RF, coax, baseband, satellite signaling, etc.) At the same time, the disclosed invention provides embedded security and traffic intelligence, and the ability to interpret, modify, and selectively filter wireless traffic for the benefit of the network user. In addition, the disclosed invention works with both wireless UWB transmissions, as well as with standard

baseband wiring-types of data transmissions, allowing the invention to be addressable by and responsive to wired networks as well as the wireless networks. In fact, the present invention allows for the fusing of wireless and wired network components so that they may be commingled and served by a single plant or server, within the same network. Thus, the invention facilitates new capabilities in connecting UWB equipped devices through a repeater operation for many other devices that may exist in a room or office or building or vehicle. In this way, for example, a doctor's office complex would only need to have a single computer, say the receptionist's desk computer or a media center, which might be connected to the internet, cable TV, copper line, or satellite station, and this single computer could serve as the host computer or server to the office network. If this receptionist's desk computer or a media center is equipped with a UWB radio, and all other devices, for example, portable computers, pen tablets, gaming devices, video monitors, or Voice over IP portable communicator devices used in the office, were configured to be on the same network (piconet) as this desk computer, then our invention would allow coverage and data transmission throughout the entire office complex, rather than being limited in range to 10 or 20 feet as would be the case for a single point-to-point communication between 2 UWB devices. Wired network devices could also be connected and served on the same network, serviced by the same plant, using the disclosed invention. Also, at the same time, the described invention provides a low cost way of providing massive data transfers, with bandwidth prioritization and security, network monitoring, and "network learning" and spam filtering not currently available in today's wireless devices. Thus, the invention helps improve and facilitate wireless high speed networking, for both mobile/portable and fixed applications, in environments such as stores, homes, apartments, cars, and factories, etc. where broadband data communications between devices, and access to the plant by several networked devices is necessary.

Figure 1 shows the internet connection 10 coming into the

home or office, which may be data only, or analog voice and data, where this "backbone" connection may be provided using wires or fiber (such as T1, T3, DSL, cable, cable modem, OC3, etc.) or wireless (last mile wireless service, mesh networks, LMDS, MMDS, WiMax, Satellite, 802.16, 802.20, 802.11a/b/g, or some other wireless distribution mechanism, such as 802.15.3.a, etc.). Once in the home or office (or vehicle, etc.), a host device 12, such as personal computer or server, or building router (a personal computer, as an example, is shown in Figure 1) is connected to the backbone. The host device 12 is further equipped with a UWB transceiver 14, which may be integrated, stand alone, plug-in, or part of a multi-band, multi-mode radio that is either discrete or embedded within a microprocessor chip, or which is connected to, attachable to, insertable into, or integrated within the host device. Plug-in cards, discrete components, embedded devices and other such embodiments are contemplated. Once connected to the backbone internet and the UWB transceiver 14, the host device 12 is able to facilitate communication to other UWB devices in the home or office. For example, in Figure 1, provided that the distance is short enough and the local interference is low enough, it is possible for the UWB Transceiver on the host device to support meaningful communications to a UWB-equipped Portable Table computer 16, a UWB-equipped television set 18, a UWB-equipped telephone 20, and even a UWB-equipped wrist watch 22, as examples but not limitations to viable uses of UWB wireless technology for personal area networks. As explained in the prior art, UWB possess sufficiently high bandwidth that new services, such as ranging or position location are easily incorporated with high speed communications, and the current invention considers supporting the myriad of applications and implementations of UWB devices. Using the standards proposed in the IEEE 802.15.3 committees, it is known that it would be possible to configure Personal Area Networks such as shown in Figure 1 using UWB, all without wiring up the local area.

Note, however, from Figure 1, that the distances (d1, d2, d3, d4) between devices vary, and the local environment may have walls or metal partitions that cause signals to decay or

fade (not shown). Thus, it is possible that the host device 12, which is typically (but not necessarily) fixed, may not be close enough to all locations where portable users of the UWB network which to operate from at a particular instant of time.

5 Furthermore, since the signal power falls off with distance, UWB transceivers that are further away from the host 12 will be more susceptible to interference from undesired users or noise sources (not shown), and will also be more susceptible to security breaches or spam attacks by undesired transmitters

10 (not shown). Battery life of portable devices will also be shorter for those which have to provide sufficient bandwidths over longer distances (higher power consumption).

Now consider Figure 2, where the same UWB network of Figure 1 now contains the invention, the UWB Repeater 24. With

15 placement of the UWB repeater 24, the distances between the host 12 and the repeater 24 are shorter than the distances between the host and other users. Thus, the repeater is able to provide the ability to extend range to outlying users, which will be important to maintain high data rates in interference

20 or crowded spectral situations. Furthermore, the repeater 24 is also able to receive the transmissions from the undesired transmitter, and may be equipped to ignore the undesired transmission, as well as instruct other users of the network to ignore the undesired transmission, thus improving personal area

25 network performance. With the invention used in the Personal Area Network, battery life of portable devices may be extended, as well.

The repeater 24 of Figure 2, in order to work properly, requires careful signal processing that is able to null out

30 noise and interference across the very wide bandwidth used by UWB (such as noise from an undesired transmitter or attacker 26). In addition, the repeater must provide significant isolation between the input and the output, typically 40 to 50 dB minimum and more if possible, in order to prevent

35 oscillation and feed forward interference. A wide range of techniques to perform such electrical performance are well understood by those skilled in the art of RF circuit and filter

design. In addition, the UWB repeater 24 must faithfully re-transmit both the forward and reverse paths of a two way communication, and must provide uniform/even group delay across most, if not all, the occupied bandwidth of UWB.

5 As shown in Figure 3, to possibly achieve fastest time to market, would be to implement this invention by using two UWB chips or devices 28 and 28'. These may be standard UWB modem devices, with sufficiently fast controlling and memory circuitry that creates a data bridge 30 between the two UWB
10 chips. These two chips, and the controlling/memory circuitry bridge 30, are built and encapsulated in a housing or chamber 32 which has good electromagnetic isolation between the input side (the side in which signals needing to be repeated are entering) and the output side (the side in which signals that
15 are being repeated are regenerated and reradiated). Power (either AC or DC) from a source 31 for the repeater can be provided from a battery or an outlet. Also, an RF switch for switching/processing antennas may be integrated in the controller circuitry, or may be a separate, discrete component
20 or series of components, such as a butler matrix circuit, simple RF single-pull multiple-throw, or phase shifter network for phased array antennas, or a wide range of well known antenna switching or phasing/processing mechanisms. While Figure 3 shows a preferred embodiment, it should be clear that
25 the entire assembly could be implemented in a different manner, for example using mixed-signal circuitry and included on a single chip, or a hybrid chip could be used and packaged as a single device, or discrete RF/baseband ICs could be developed and used. The ability to control RF antenna signals, coupled
30 with baseband processing, would allow many well known Multiple Input Multiple Output (MIMO) antenna technologies to be used to improve link quality. It also should be clear that each of the antennas (32, 34, and 36 shown in Figures 3, and 38 and 40 shown in Figure 4) may be a single antenna, multiple antennas,
35 antenna arrays, and may take on many different physical forms.

Each physical side of the UWB repeater invention may at one time serve as the input and another time serve as the

output, as the invention offers simplex, half duplex, or full duplex capability. It should be understood that each side of the invention could itself use MIMO antennas or phased/steerable antennas. Similarly, the forward or reverse signal path may use either side of the UWB repeater. Antennas, such as those developed by Prof. Hao Ling at the WNCG at University of Texas, and by Warren Stutzman of Virginia Tech, allow wideband UWB transmissions with some directionality, and these are easily sprayed on or built from metal stock using metallic film on plastic cases. Dielectric antennas, or antennas with inherent notching capabilities, may also be incorporated as is known in the prior art. The directionality helps with isolation between the input and output of the repeater. Further, the repeater may use multiple antennas, in a sector arrangement, that can automatically be sensed and switched by the UWB devices and/or the controller circuitry, in order to focus energy in directions of where devices needing to be transmitted through the repeater are located. This could be used on both or either transmit or receive operations. A wideband RF switch, which may be a MEMS device such as contemplated by Hughes Electronics or Teravicta of Austin, TX, is part of the circuitry contained within the repeater, so that various antenna selections are made. Alternately, RF switches can be avoided and RF processing may be used to provide Maximum Ratio Combining, Linear Combining, Equal Weight Combining, or MIMO implementations, all which are well understood by those skilled in the art, may be made. Other low-cost RF switches could be employed, as well, for antenna phasing/steering and selection, and the switch could actually be incorporated in future UWB chipsets or other integrated circuitry in various ways known now and in the future.

- As shown in Figure 4, an alternative approach to creating the UWB repeater invention, rather than using two stock UWB devices with some additional control and memory logic for data processing, signal processing, and antenna switching or diversity/beam forming, would be to use a true bent-pipe repeater approach, where all signals at the input are simply re-radiated at the output. Note that the very wide bandwidths involved with UWB make this approach more difficult today, yet

viable in a low noise environment that does not have swamping. Even in higher noise environments, DSP noise cancellation and wideband compensation such as phase linear processing, and careful isolation and compensation across the wideband spectrum could be employed. This type of DSP processing will be available in reasonably low cost platforms within the next several years.

Alternatively, Figure 4 represents an application specific integrated circuit 42 made of Si, SiGe, GaAs, or other known materials either within a chip, a system on a chip, or discrete circuitry, could be fabricated to implement an integrated repeater with processing circuits for data processing that provides network security and data buffering as well as desired bandwidth provisioning for different applications passing through the repeater. Clearly, an integrated antenna would be a less expensive per-part product price, once the design was perfected, and a single antenna repeater with near omni-directional radiation pattern offers lower costs to manufacture, and would be more preferable for generic in-home or office use. As noted in Figure 3, power (either AC or DC) can be provided by a source 31, such as a batter or outlet.

Note that instead of using multiple antennas and having two "sides" (an input and an output) as shown in Fig. 4, the UWB repeater could instead use a single antenna, and could use a vast memory (either onboard in chip or external to the RF or processing circuitry) to simply buffer and retransmit the received data. This would induce a greater delay in the repeated signal, but would provide a less expensive form factor, due to fewer antennas, would offer smaller size, and would save costs due to the lack of expense incurred with an RF switch for the antennas. In addition, a store and forward approach embodiment such as contemplated in this paragraph would remove isolation concerns that provide design challenges in bent-pipe or simultaneous receive/transmit repeaters.

A key part of this invention, which is now described, is the data processing capabilities afforded by the UWB Repeater disclosed herein. Figure 5 illustrates the architecture of the invention, which includes RF component 50 and 50', baseband

component 52 and 52', pipeline component 54 and 54', memory 56, and a controller 58 with an integrated or separate processor component 60. Each of these architectural components may be used for both the received (incoming) and repeated (outgoing) signals, or may be replicated so that one set of components is used for the incoming side and one set of components is used for the output side. (e.g., see Figures 3 and 4 and alternate embodiments described). The pipeline, processing, control circuitry and memory may be the same entity (e.g. all contained within a microprocessor, a DSP engine, or microcontroller, for example), and it may also be the same physical circuit or chip that also contains also the baseband and RF components. Alternatively, the memory (or any one of the other components, or combinations of components) may be in a separate chip or device. Note that the architectural components shown in Figure 5 may be of a wide range of varieties and physical structures that may be on chip or on a separate chip or substrates, or may be distributed in different pieces of equipment or embedded in other components or circuit boards, or embedded in firmware, software, or operating system software, not shown explicitly. It is clear that multiple processors and multiple replications or parallel implementations of the embodiment shown in Figure 5 may be practiced. Alternatively, the pipeline processors or memory (or other components) shown in Figure 5 may actually be the same physical device, and may only require a single device for handling both input and output functions. While the architecture shown in Figure 5 is a preferred embodiment, the functionality of the architecture, described below, may be implemented in alternate embodiments with varying approaches to providing the functional architecture, which are not meant to be excluded or limited herein. It should be clear that well-known signaling details, such as clock signals, analog and digital voltage sources, and power supplies, etc., while not explicitly shown in Figure 5, are known to one of ordinary skill to be a required part of any functional device, and the sources of such signals could be provided in a distributed fashion or represented within any one of the architectural components during normal operation.

Note that the architecture of Figure 5, when equipped with a sufficiently powerful baseband component 52 and 52', allows the UWB repeater to be used in a hybrid wireless-wireline network, where input signals may be applied directly to the baseband component 52, and output signals may be sent out the baseband component 52', for example, using standard Ethernet, DSL, ATM, SoNET, or other standard baseband signaling format. When implemented using parallel components (e.g. parallel baseband and pipeline functions or multithread processing or fast time slicing), the architecture of the invention allows for both RF UWB signals and baseband signals to be received at the input-side, and both RF and baseband signaling to be transmitted at the output-side, due to the fact that the baseband processor is able to implement both wireline PHY and MAC standards, as well as wireless UWB standards (or a universal PHY/MAC). This is shown in Figure 6.

The ability to handle both wireless network and wired network traffic is a valuable capability, as it allows the disclosed UWB transceiver/repeater 62 to not only function in an all-wireless network, but allows it to be connected in a hybrid network, where wired devices and wireless devices may all be connected together through the invention, making it easier for the consumer to connect multiple devices in a home, for example, or to connect all devices (both wired and wireless) to a single plant connection 63 (an internet plug, for example) in the home (thus, the invention not only provides repeater functionality, but also itself may be connected to an Internet/DSL/Cable/Satellite/Wireless backbone plant or server). It is possible that both input signals at RF and input signals at baseband could arrive at the invention simultaneously, and may be properly processed and filtered and buffered and routed to provide network connectivity to other devices and the plant or server, as well as providing additional sources of data for traffic statistics, security, monitoring, and network maintenance chores. This architecture enables a low cost, flexible UWB repeater to serve as a junction box, connecting both wired and wireless devices to the same network, and optionally to the backbone plant, as well (See Figure 6).

Figure 7 shows a flow chart of the processing steps preferably performed by the invention, it being understood that the order of these steps may be varied. The controller component of the UWB Repeater/Transceiver architecture first
5 acquires network information and/or desired performance criteria at step 64. That is to say, the controller component of the disclosed UWB repeater must be given explicit or implicit operating instructions, either from the plant, from the network itself, from one or more components in the network,
10 from the owner or operator of the network, or from a rule-base developed from past history of the repeater itself, or from the particular device or devices the invention is intended to communicate with within the network. When embedded in a consumer electronic device, such as a PC, a car, or a home
15 media center, the controller component may be accessed by a very simple user interface provided for the user, that allows the user to enter in one or more of a network ID (his or her own password or desired name, etc.), a listing of equipment to be configured, a count of equipment that they own, a listing of
20 computer applications to be used in the network, a rough coverage area of particular wireless devices or components she wishes to have connected on the network, or other such data necessary to provide a rough guideline of the network operational characteristics desired by the user.

25 To be clear, however, an alternative embodiment would require no user interaction, as the home media device or the UWB repeater device itself may have a unique serial number ID associated with it, or may have some embedded data, or a table look up for a particular application, and this may be used (in
30 connection with other data, such as provided by the plant) as the basis to launch transmissions in the network to detect and "train" all other UWB devices in the home network to assure they are properly connected to the network, all without any intervention or knowledge by the user.

35 Once it knows the "parameters" or "openness of the network" and knows the characteristics or ID's of those devices that "belong" on the wireless network, the controller component is able to then provide low-level instructions for the proper functioning of the UWB repeater. In this manner, the

controller component establishes initial operation mode settings for the repeater at step 66, so that the busses are properly configured and the architectural components are preset to properly respond to various signals or conditions received from the UWB input-side, the plant, the wired network, or from the host device, etc. In other words, preset conditions (initial operation mode settings) may instruct the repeater to perform certain functions in a wide range of scenarios. For example, the initial operational mode settings may instruct the repeater to provide: (A) normal repeater functions (bent-pipe operation) with no storage functionality when the RF channel is clean and no spammer or interferer is detected at the input side of the UWB repeater, (B) to provide no repeater function when spam is detected, and (C) to report traffic statistics to the strongest or closest network component when a particular command is received over-the-air or on the baseband network. This is meant to simply illustrate the processing logic which is possible, and is merely a representative example not intended to limit the possible set of logic tables and condition mappings that are possible. It is clear that command and control logic can be created to provide sufficient flexibility and breadth of preset conditions. Further examples are given throughout the text below. It should be clear that for rapid flexibility and adaptability, preset conditions for several operational scenarios provides a low-overhead way of assuring the architectural components have access to the busses and to each other, in an efficient manner, when a key event (a trigger event) occurs due to a received signal or due to a need to transmit.

The controller component receives and sends electronic signals via one or more busses from one or more of the RF, baseband, memory, pipeline, and processor components. The controller has connection with the other components of the transceiver architecture, and facilitates instructions that may be read or written between each of the components over a bus (for example, I2C bus or new higher speed busses). Thus, communication of instructions and control signals and information may be written or read between the components, using either serial or parallel and unidirectional or

bidirectional bus structures. The controller component is able to address each other component of the architecture within the UWB repeater, and then has the ability to read or write control data to each component as shown in step 68, in order to

5 establish or learn operating conditions from the received input signals or plant, to instruct devices with preset instructions, or to provide instructions that have been established by the network or user or application that is being received or transmitted by the invention. The proper configuration and

10 access to the busses is preprogrammed (preset) for specific operational instructions depending on the operational conditions encountered by the repeater. That is, each component, based on received signals and the computations performed during normal preset programmed operation which

15 proceeds according to step 70, knows through preset instructions how it should send signals to the controller or to the other architectural components, for proper desired operation in various operational conditions.

A trigger event 72 occurs when there is a perceptible

20 change or instruction, obtained through either the data received over the air on the UWB radio channel(s), or through the wired baseband network, or through instructions issued by the host unit housing the invention 74, or through data received from the plant 76. The order of these and possibly

25 other trigger events caused by the repeater reacting to particular received data or host device, plant, or server instructions, could be different from that shown in Figure 7. A trigger event may also occur when the transmitter is instructed or preprogrammed to transmit data (not shown in Figure 7 flow

30 diagram). Trigger events are due to signaling which is found to trip a condition or to signify a change in the current operation condition, or may occur due to preprogrammed, timing-based instructions previously instructed and preset by the controller component. Depending on the interpretation of the

35 trigger event (performed by the controller architecture in conjunction with other architectural elements), the UWB repeater may simply continue to operate with the preset mode settings as originally programmed (with the same preset operational conditions), or a new course of action may need to

be taken, in which the trigger event causes the controller architecture to consider providing new preset instructions for various operational conditions going forward.

5 The controller architecture determines at step 78 if such new preset instructions are needed, based on the computational results of the pipeline and processing components, in conjunction with memory, and may use one or more rule-based algorithms that tracks history, or may simply follow instructions specified by the network user, the host device, 10 the plant, or the repeater itself. As described in more detail below, trigger events (e.g., 72, 74, 76, etc.) occur when there is a change in the network, and may be due to the reception of undesired data at the UWB input-side, undesired data on the baseband network, errant or counterfeited or spoofed ID's, 15 watermarks, or a wide range of important conditions that indicate a change in network performance, the user's application, security conditions, signal or data integrity of desired transmissions, or the presence of jammers, hackers, or interferers.

20 As an example of how a trigger event may be detected, and to understand why the controller may wish to assign a different set of preset instructions for operational conditions going forward after a particular trigger event, consider the example of a UWB repeater functioning in a benign RF environment 25 without interference. The device is receiving transmissions from desired in-network components and is retransmitting them, per the normal operational instructions. Now, assume a spammer or hacker attempts to jam or intrude on the network. The disclosed invention is able to detect the demodulated signal 30 using the processing power pipeline processor in conjunction with memory and the processor, that the intruder is not a valid in-network component, and in fact may further check the intruder's ID or characteristics to find a match with an "unwanted" list of known attackers housed in memory. This 35 detection of the intruder is a trigger event. Now, consider the case where the preset operational instructions simply called for the repeater to stop retransmitting the intruder's transmission when an intruder is detected. Now, because the hacker appeared on the "unwanted" list in memory, this intruder

may be deemed to be a serious problem, in which case the controller architecture has the opportunity to alter the preset instructions for operational conditions going forward, as is done in step 80, and it may be advisable to now alert other devices and the host computer of the presence of the hacker whenever it is detected going forward. The new preset instructions passed from the controller component to the other architectural components may now be such that if the hacker transmission is identified again at the input-side of the repeater the repeater doesn't stop retransmitting (as before), but now the repeater rebroadcasts a warning message, an alert message, or a message to the network that instructs all other users of the hacker. It should be clear that various techniques known now or in the future to protect from spamming and to avoid unwanted intrusions may be incorporated into the invention using the processing techniques described here.

Using the system and method described here, network usage, network statistics, network provisioning information, or network security status for particular users, devices, applications, transmissions, or ID's would be known, measured or detected, and can be stored and communicated to a network server, another network component, a device controller, or through the plant using techniques known now or in the future.

The controller component updates the preset instructions for operational conditions at step 80, and provides actual control of RF and baseband signals, at a relatively slow rate (slow relative to the individual per-bit durations of the multi-megabit per second data rate received and sent by the invention over the air). Slow tasks for 100 Megabit per second data transmission for example, would require processing and control signaling on the order of a microsecond or so, as opposed to fast real-time data processing that would require speeds on the order of 10 nanoseconds or faster (such fast processing is handled by the pipeline and processing components, and the baseband and RF components). It should be clear that slow and fast are relative, and that this should in no way be limiting, since real time and "near" real time speeds shall change over time, application, and technology. Slow tasks handled by the controller component include enabling the

adaptive signal processing, so that the initial antenna configurations may adapt to interference from a new transmitting source, or halting the transmission of an undesired signal, or the halting of spam over packet duration or multiple packet duration intervals (rather than bit duration intervals), or determining and invoking new instructions for operational conditions, or instructing memory or computation operations to begin or end, or instructing various warning or response messages or traffic statistics to be computed or reported. The actual computational chores invoked by these instructional messages by the controller architecture may happen at much faster rates. For example, the controller architecture is required to issue control signals to allow for antenna pointing, steering/phasing, MIMO adaptation to be invoked, and once the controller component enables this functionality to the appropriate architectural components, the on-going processing and signal manipulations and adaptations occur at much faster speeds.

The controller architecture provides preset instructions for operational conditions to various components, as well as enabling what operations they should perform ahead of time of the actual trigger event (e.g., the pipeline devices would be instructed the network ID or watermark to search for, or the particular error control coding or MAC or PHY that is to be used). The controller architecture also provides operational instructions to the memory, for gathering of data and statistics, as well as providing event-driven (trigger-driven) instructions for handling the gating of packets and data. Also, the controller allows the processor to communicate the results of its computations to other architectural components, or translates the results (with the aid of the processor) into control signals. Clearly, for implementing security features and software radio/antenna pointing chores, signal results must be detected and computational problems must be solved by the Pipeline and Processor components, as well as baseband and RF components, as described below, and the results of these solved computations must be used to continually drive the proper performance of the device without delays imposed by the controller component. The controller thus provides the initial

and overall approval, and then simply facilitates the communication of such commands and instructions, and ensures the busses connecting the components are properly aligned for the specific tasks that need to occur for particular fast and
5 slow processing and data passing chores.

As shown in Figure 7, the UWB repeater continues to process in the manner described above, in a continual loop as shown in step 82, until an instruction to terminate operation is received as shown in step 84 (either received from a data
10 source - wired or over the air, or from the plant, or the host device, or from the controller architecture, or the power supply is simply turned off to the device), at which point the processing is completed as noted in step 86

To describe the architecture of the invention in more
15 detail, and to provide further examples to illuminate Figures 6 and 7, the following detailed description is useful.

Memory may take a wide range of forms as understood by those skilled in the art, including high speed RAM, DRAM, Flash chips, memory sticks, removable disks, etc, and this memory may
20 be programmable, static, dynamic, random access, optically-processed, etc. such that vast amounts of data received at the input of the invention may at any time be stored, buffered, processed, interpreted, or retransmitted. The power required for the memory may be supplied by the same power supply that
25 powers the processor and RF components, or it may be a separately provided DC or AC power supply, depending on the particular implementation or structure. For example, if the disclosed UWB Transceiver were embedded in a plug-in memory stick, it would likely receive power and data flows from the
30 standard USB expansion slot, whereas if the invention were embedded within a PC or Media Entertainment Center, the pipeline processor, memory and UWB RF and baseband circuitry might be embedded in a chip or an assembly on the mother board of the PC, itself, thereby obtaining power from the internal PC
35 supply. Memory is used by the present invention to store one or more of received data, forwarded data, to hold data strings or compressed versions of such strings needed by the controller or processor, to store execution instructions of the processor or controller, to store watermarks, identification data,

(ID's), PHY or MAC instructions, other software radio instructions, calibration settings, table-look-up data for modulation, demodulation, coding, antenna pointing, antenna phasing, coding and decoding, processed data statistics, or any
5 other data that needs to be stored and retrieved later. Memory may actually be comprised of different technologies, with different power levels, sizes, speeds, etc. whereas some part of memory is used for very fast storing and recalling, and the other part of memory is for longer term storage that does not
10 have to be accessed very quickly.

The pipeline component processes data on a bit by bit or word by word basis, and thus has an extremely fast ability to process or make decisions on applied data. They have special architecture and house their own memory, and are designed
15 specifically for rapid real-time data-streaming processing. The Pipeline component is able to implement real-time processing algorithms (such as coding, etc.) or compare or process inputted data to a preset pattern of data in a very streamlined, fast manner (e.g. it can function as a digital
20 matched filter, or correlator, an error correction coder or decoder, a check sum counter, or provide other fast, bit-by-bit computational functions that provide very rapid processing typically required in broadband communications), thereby allowing the device to know whether patterns of data are
25 properly tagged or apportioned. Stripping of headers in packets, finding ID's of words or bit-sequences in data streams, detecting or correcting bit errors, verifying or inserting watermarks in data transmissions, detecting security information, such as keys, passwords, handshake data, etc. are
30 typical tasks performed by the Pipeline. The Controller is able to instruct the Pipeline component as to which data should be
- checked, and may also provide timing or observation interval information, as well.

Furthermore, the pipeline process is instructed to
35 correct errors or insert ID's or watermarks or security data on transmissions, if it has been so instructed to by the controller. This is a powerful feature that allows the device to modify the data for retransmission in the network. For example, if the invention is used in a home network, a

particular home network ID or watermark or key code may be assigned (inserted into the data) of all desired home network transmissions, and the Pipeline component on the input-side of the repeater may be instructed by the Controller to constantly
5 search for this ID or watermark or key code to be received in order to determine the received signal is "desirable" or valid and that it should be repeated for retransmission. If errors occur, the invention may modify the received data stream for error correction. Alternatively, the network may need to change
10 the watermark or ID or key code of the received data, and the invention is able to make such alterations to received data, and retransmit the altered data.

Also, the pipeline component may be constantly be searching for "critical" or "unwanted" or bad transmissions,
15 which have data streams, ID's, erroneous crypto words, or other identifying data segments or information that is stored or updated in memory and which can be compared to received data. Such critical or unwanted transmissions may be indicative of an attack or unwanted spam or an emergency reason to stop
20 transmitting, and upon receipt of such data, the invention may, under previously set directions of the controller component, send an alarm message or urgent traffic message, or may send a message for network shutdown or device shutdown.

Depending on the type of network, the desired security,
25 the particular protocol or common air interface, PHY, MAC, the particular watermark or ID, etc., it may be desired for the received signal to be immediately retransmitted (repeated) at the output-side of the repeater with minimal delay, in which case the controller would have directed the pipeline component
30 to pass the data immediately to the baseband modulator on the output side of the repeater. (In this case, the pipeline components may have modified the data to correct errors, insert ID's, insert position or time stamp information, pass along network statistics or traffic/spam/utilization data, or other
35 important network -specific data that is to be carried and repeated for the particular application or particular network implementation). This streamlined operation avoids delays in reading and writing to and from memory, and would provide an extremely fast retransmit time, while allowing modification or

repair of received data. Alternatively, while the data is sent to the output-side, it may also be stored in the memory simultaneously (most likely through a memory pre-buffer that is used to capture all the data in parallel as it is sent to the transmitter, but with a sufficiently deep buffer that allows the transmitted data to be cached and stored to memory which operates at slower speeds than over-the-air RF transmissions - this is not shown but understood to one skilled in the art). Furthermore, the controller may have provided instructions to the pipeline device that upon one or more particular received data streams (for example, data streams that have been associated with Spam, peer-to-peer, or undesired transmissions, and which were stored in memory and earlier communicated to the pipeline device and stored there), the pipeline device is not connected directly to the baseband component of the output side, but instead the data passed by the pipeline component is stored directly to memory, or is simply ignored. In this manner, the invention is able to detect and filter unwanted RF data. The device may also have a reradiate mode, where received RF data stream is demodulated, pipelined, stored in memory or modified with a network ID, watermark, or counter, and then rebroadcast back to the originating RF source. This would be valuable for position location determination using time delay and/or signal strength measurement or prediction (as explained in many well known references, including work by Bahl, Rappaport, US Wireless, etc.), auditing of the network to determine how many devices are on the network, and with what ID's or watermarks or codes, determining propagation times, or used as part of a network throughput measurement scheme or traffic monitoring capability, etc.

- The controller component thus works to ensure the Pipeline component and the memory and the Processor component, and the busses are properly configured to handle the desired chores. Received data is received at RF, demodulated at Baseband, and passed to the pipeline component, and the preprogrammed pipeline processing component thus works with the controller and the memory to either store (and not retransmit) the received data, store and forward (e.g. retransmit) the received data through the baseband and RF components on the

output-side of the repeater, or alternatively the repeater may ignore the received data and not store it, or store the received data and retransmit it back to the originating source. Alternatively, the received data may be stored and

5 retransmitted out of one or more antennas, including the antenna which originally received the received data. Furthermore, the data may be modified by the pipeline processing circuitry (or by the processor and memory) once its received, for example, to strip off unwanted or hostile data

10 contained in the received data stream at the input of the repeater, or to add bit or packet changes in the packet data structure to implement ID or security or validation or bandwidth priority information in the repeated data which is radiated out of the repeater. Thus, the UWB repeater has the

15 ability to monitor data which it receives, as well as to store it, forward it, return it, or modify it. All the while, the memory, working in conjunction with the processor, may use a different or same thread to build statistics and observe particular behaviors of the traffic, including the ability to

20 sniff the packets and determine desired and undesired users, attacks on the home or vehicle or enterprise network. Thus modification of the MAC and IP layers, based on the flow of data or the availability of errors or desired QoS detected by the controller, is contemplated and capable with the invention.

25 It should be clear that the above description and following preferred embodiment emphasizes modification of a received signal and the associated processing steps prior to retransmission out of the UWB repeater. However, it should also be clear that similar functionality and capabilities may be

30 achieved for the transmitted signal itself, where the same architectural components may be used to similarly process, modify, store, retransmit, or ignore signals that are otherwise intended to be sent to the output side of the device. Also, prepared messages or messages based on the computation of

35 statistics or memory contents, messages based on alarms, network activity, the errors or transmissions or security breaches or ID's detected on the input-side of the repeater, or messages that are meant to synchronize for timing, positioning, or used to simply communicate the repeater's health, status, or

alarm status (due to spamming or RF overload or interference, for example) may be sent by using the memory and based on results computed from the processor component or controller component. Such messages or data transmissions may be read out
5 of memory, or processed through the pipeline component, passed to the baseband and RF components for transmissions to the output-side of the repeater. This enables the invention to provide beacon signals and messages regarding traffic, security, spam alert, alarm, position location, network use or,
10 other preset messages for use in various applications, independent of the exact data being received at the moment by the input-side of the invention.

The capability of the UWB repeater to process and to modify the bit streams sent and received is powerful, as future
15 security methodologies will rely on streamlined processing to implement rapid/dynamic key changes, dynamic network ID or watermark changes, and to allow authentication and validation. Emerging security standards, such as IEEE 802.11i, which use dynamic keys and strong codes, as well as EAP, 801.1X, WPA,
20 and future security techniques that may encompass both indoor and outdoor networks, will be able to be used by the disclosed invention, due to the capabilities of the processing and the modification capabilities of streams flowing in and out of the repeater. Furthermore, the repeater itself will be addressable
25 on the personal area network, allowing the host/master "source" device, such as the office PC or TV console, to inquire, control, and to gather characteristics of piconet users, their traffic, attacks, throughput performance, coverage performance, or unintended or intended usage through the repeater. For
30 example, the host could access the memory of the UWB repeater for detailed data, as well as collect statistics gathered and processed and stored by the UWB repeater, so that the human user of the network could gather a report of activity. Getting reports back from the UWB repeater can be done over the same
35 Personal area network (PAN) that is used for wireless connectivity, or could be carried out using a wired network, if the invention happened to also be connected to a wired backbone, such as Cat-5 Cable (As described subsequently, the UWB repeater invention may have internet connection jacks that

would allow it to also be connected to a wired infrastructure).

Furthermore, without human intervention, the host could gather data from the UWB device, and use that knowledge for real time or near real time control for providing security, changes in
 5 security keys or protocols, changes in bandwidth provisioning, and could even provide a termination of the home network from the internet, in order to prevent the home network from being attacked or compromised.

The ability of the UWB repeater to process data and
 10 gather traffic and network conditions, including bandwidth provisioning data and security-related data, will be extremely useful in appliances that serve as in-home or in-office network controllers and interfaces, where the Internet is connected and then served wirelessly throughout a building. The UWB Repeater
 15 disclosed here would be fully compatible with RADIUS servers, and in fact could help provide the connectivity required for home devices to gain access to the Internet, as disclosed earlier. A web-enabled interface, or windows, or some other PC or Tivo/TV/VCR/Cable Modem/Satellite type programming interface
 20 could be supplied to program and control, as well as gather data from, the UWB repeater disclosed here.

The controller uses memory, such as flash, dram, PROM, and a wide range of other possibilities, based on speed, price, form factor and availability, to support the processing and
 25 buffer-and-forward operations. Coupled with the computational capabilities of the processor and pipeline components, and given the functionality of the baseband and RF components, one can readily see that a powerful network security capability can be implemented while simultaneously providing broader, reliable
 30 network coverage.

- Consider one embodiment of the memory portion of this invention to be like today's Memory Sticks that currently have 60 MB of memory (but will have much more in the future) and plug into a PC port for power -- the invention could have the
 35 same form factor, for example, as a plug in memory stick today, where the UWB repeater invention, including memory, is simply plugged into an access port on a PC or other home appliance. The UWB repeater, if in the form of a plug in "stick", could also enable the equipped device (which could be the source/host

device, or some other device in the PAN) to connect via the UWB home network, while supporting the repeater operation within the PAN, while providing the capabilities of identifying the types of traffic and priorities which should be given such traffic within the PAN. Also, network management protocols and external devices and software, such as that located on the host PC, may query and retrieve the gathered data at the UWB repeater, and may adjust or control the UWB repeater processing modes (via the controller component) for particular desired network goals - such as greater security, more stringent prioritization on traffic, or even complete reboot/restart of processing in the UWB repeater. It is obvious to one skilled in the art that the UWB repeater could operate in concert with other devices, such as the host or other users of the Personal Area Network (e.g. home network) in order to provide distributed communication and command and control functions between the UWB repeater and other devices. In fact, it should be clear that the architectural structure of the UWB repeater may be distributed between hardware, embedded software, and an operating system which ships separately from the hardware, such as Windows or Linux, so that mass-produced UWB repeaters could be embedded or easily attached to existing appliances or computers.

The repeater may also have security provisioning such as an "authentication" or validation, as well as non-eradication function. Depending on the particular network scenario, network assignment steps can ensure the UWB repeater is being used to "repeat" signals from only those devices which are intended to be repeated within the home or office. This functionality could be done at layer 1 (PHY) with identification or authentication code sent over the air and detected by the Repeater, or performed at layer 2 (MAC) with handshake with other devices on the network, or a combination of layers being used for the security or authentication step, but this just as easily could be performed at higher layers, even performed up at the application layer (such as with VPN, web login, telephone dial, or some other computer-controlled authentication implemented automatically by one or more devices on the network, or implemented by the user on a

software interface, computer program, web site, or data entry method that connects to the home/office UWB network). Also, just as today's IEEE 802.11 bridge/repeater products, the UWB repeater may be equipped with MAC address association control, and could easily have one or more integrated wired Ethernet port connections for use on a standard wired Ethernet connection (not shown in figures). These techniques are well understood by those knowledgeable in IEEE 802.11a/b/g and 802.15.3a/b standards activities, which have become widely popular in recent years, and the present invention, while not required by such standards, could implement such standards if the baseband and RF architectural components were properly configured to conform to the MAC and PHY standards.

For example, a preferred embodiment of this invention has the UWB transceiver/repeater 88 be mounted in an AC outlet for wall use or for barrier-strip extension cord use (See Figure 8). Alternatively, the device could be integrated in a consumer electronic device (a cellphone, or PC, or a home entertainment center, for example), and would be controlled by or interact with a software program running on a home computer or a game console or TV (a "host"). The host would allow the person using the home/business/vehicle network to type in or use a remote control or mouse device to connect his or her own home/office network, and the network would use UWB devices to communicate with each other to provide the network, and in doing this manual configuration, the user is able to input identifiers, such as product name or manufacturing codes or some other identifier of other appliances for the home network that the user is able to enter. This operation may also occur automatically, without manual intervention by the user, by the self-configuring Personal Area network "waking up" and reading the serial numbers/device codes through the airwaves automatically, and finding the UWB repeater.

Returning to the manual example of a home network appliance, in doing this data entry, the user is implicitly setting up security features which allow the myriad devices in the home to know they are on the desired network, and the UWB repeater is then able to know, through shared knowledge of this security information, which devices should be "repeated" and

which devices (say from a neighboring building) should be "ignored" and not repeated. In this example, the UWB repeater could be embedded within the PC or cable TV product, or it could be communicated to wirelessly or via cable by the home computer or cable TV product, or it even could serve as the host, itself, where it is connected to the internet using wireless or wired means. Of course, one skilled in the art would understand the invention could also having no security or more limited security, where some or all messages within earshot would be repeated by the UWB repeater, or whereby some messages would not be repeated due to inherent knowledge of local devices and their valid signaling or data transmission. Also, it is clear that much simpler, automated, or built in configuration capabilities for specification of network parameters or operational conditions could be supplied, say within an operating system, or embedded in software or hard codes in a consumer device, itself.

In addition to security features disclosed above, the ability of the UWB Repeater to sense real-time data transmissions, such as network ID's or bit-streams associated with security or keys, allows any application to provide its own data coding, carried above the MAC and PHY layers, to enable particular desired features of network provisioning and bandwidth provisioning controls, so that some users (such as portable email or low rate data or low rate audio) are allocated some delay, or less important priority, in being retransmitted than are high priority data, such as video data or voice over IP telephony, or high bandwidth messaging or urgent information which has less tolerance to delay. This quality of service (QOS) intelligence could be identified within the MAC, PHY of standardized UWB equipment, but also can be inserted and detected by the disclosed invention when such signaling appears in the IP layer and/or other higher layers of the application data that is transmitted over the network. Thus, the invention allows electronics makers to create their own higher layer UWB protocol, or even a universal PHY and MAC layer, using standardized components, which also allows the UWB Repeater to prioritize and provision certain repeated data over other repeated data, by simply exploiting the fact that each

UWB repeater device is able to detect actual data and can operate on such data using the architecture described above (see Figures 5 and 7). For example, data bits which alert the repeater and the network to the particular type of user/device can be used to help prioritize the UWB repeater's processing of the data which is to be repeated. In fact, the UWB repeater could be used in network test, where the memory and controlling circuits are used to induce a fixed, known, preset, or desired delay on particular traffic which is received by the repeater, in order to test "ringing of the network" or to determine if attackers or interference are correlated with the operation/transmissions of particular devices on the PAN.

The form factor of the UWB repeater may take on a wide range of sizes, shapes, and mounting/fixture options. This repeater could be installed or embedded in PCs, servers, or appliances, or it could be a stand alone device that could be purchased and placed in any home or office, embedded within a fire alarm, air freshener, night light, or phone. Alternatively, it could be a plug-in device, much like plug-in chassis cards are used today to enable WLAN access or modem access in PCs.

Figure 8 illustrates a preferred embodiment of the invention, embedded within an AC Power strip. The AC strip could be built into the wall or purchased as an extension cord in hardware stores, etc. Note that the power strip has standard AC wiring to connect to the home or office AC power, but also has a connection to the "plant". This plant connection 94, which is optional in the practice of the invention, may be a physical connection, such as through a cable that connects the UWB transceiver to an Ethernet port, Cable TV outlet, DSL outlet, etc., or this port connection may be a wireless connection (for wireless access, the embedded UWB transceiver might be connected to a WiMax radio or Mesh Network transceiver, enabling wireless to come in to the UWB transceiver and be redistributed through the repeating function. Alternatively, the plant connection may be optional or unused, and the UWB transceiver simply implements the repeating and security functions described herein. This is an example of one of the myriad of form factors that can be used.

One could use the invention as part of AC extension cords, photocopiers, game consoles, television/video displays, video consoles, hospital video equipment, multimedia centers, air fresheners, fire alarms, etc. Fixtures, colors, shapes, and sizes may be very similar to fire alarms or air fresheners that plug into AC outlets in the home, or are wired into a car DC power supply, and the repeater device may also become embedded in objects that are typically carried around the home or office, such as but not excluding cordless phones, cell phones, portable computers, home stereos, TVs, pet collars, tennis shoes, and a wide range of portable, common devices that when moved could provide a wide array of range extension and coverage improvements of UWB devices. In fact, devices which integrate video, gaming, audio, and computing will likely benefit greatly from the disclosed invention. This invention may be a stand alone plug-in device, or may be embedded in AC outlets, receptacle extensions, and could become part of future phones or AC extension cords. The positioning and ranging capabilities of UWB make this applicable to tracking children and pets, or finding vehicles in large parking lots, as well.

It will be clear to one skilled in the art that the above disclosed invention may be applied in a wide range of applications and configurations as captured in the scope of the appended claims. Furthermore, the specification is not limited to a particular radio air interface standard or radio PHY or MAC definition or implementation.

CLAIMS

I claim:

1. A broadband wireless repeater, comprising:

at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband devices, and at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and

a controller, which is either pre-programmed or programmable with network information, which controls the screening of data received by said at least one receiver, and either passes, ignores, rejects, redirects, modifies, or kills received data, said controller providing such data screening in order to differentiate between desired and undesired data for network security, network management, or interference mitigation purposes,

said controller controlling reception of electronic signals or data by said at least one receiver and transmission by said at least one transmitter,

said controller further providing for the collecting, reporting, or storing of network usage, network statistics, or network information.

2. The broadband repeater of claim 1 wherein said network information includes IDs for each of the components to be used in a network.

3. The broadband repeater of claim 1 wherein said network

information includes IDs for users permitted to be used in a network.

4. The broadband repeater of claim 1 wherein said network information includes a specified coverage area for wireless devices to permit use of a network.

5. The broadband repeater of claim 1 wherein said network information includes specified applications permitted to be used in a network.

6. The broadband repeater of claim 1 further comprising a buffer memory for storing received electronic signals for processing by said controller.

7. The broadband repeater of claim 1 wherein said at least one receiver receives electronic signals by either or both a wireless communication or a wired link.

8. The broadband repeater of claim 1 wherein said at least one transmitter transmits electronic signals by wireless communication.

9. The broadband repeater of claim 1 wherein said at least one transmitter transmits electronic signals by wired link.

10. The broadband repeater of claim 1 wherein said at least one transmitter transmits electronic signals by either or both wireless communication or by wired link.

11. The broadband repeater of claim 1 wherein said at least one receiver and said at least one transmitter and said

controller are associated with an AC outlet or a wall fixture.

12. The broadband repeater of claim 1 wherein said controller permits network information to be modified.

13. The broadband repeater of claim 1 wherein said controller uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones of transmissions or reception.

14. The broadband repeater of claim 1 wherein said controller permits support of position location capabilities for use by a network.

15. The broadband repeater of claim 1 wherein said controller directs undesired user or intruder information to be passed to other components of a network from said at least one transmitter using either wireless or wired connectivity.

16. The broadband repeater of claim 1 where network provisioning information is passed to or pre-programmed with said controller, for purposes of network traffic provisioning, wherein said controller uses said provisioning information to prioritize either or both reception of data and transmission of data to or from said repeater.

17. The broadband repeater of claim 1 wherein said transmitter and said receiver have reversible input/output directions.

18. A broadband wireless repeater, comprising:
at least one receiver for receiving electronic signals
at least some of which are sent by one or more ultrawideband

devices, and at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and

a controller which is either pre-programmed or programmable with provisioning information for purposes of network traffic provisioning, wherein said controller uses said provisioning information to prioritize either or both reception of data by said at least one receiver and transmission of data by said at least one transmitter, said controller controlling reception of electronic signals or data by said at least one receiver and transmission of electronic signals or data by said at least one transmitter.

19. The broadband repeater of claim 18 wherein said provisioning information prioritizes by network user.

20. The broadband repeater of claim 18 wherein said provisioning information prioritizes by type of data being received by said at least one receiver.

21. The broadband repeater of claim 18 wherein said provisioning information prioritizes by type of data being transmitted by said at least one transmitter.

22. The broadband repeater of claim 18 wherein said provisioning information prioritizes by the particular type of application being used by one or more users of the network and

being received by said at least one receiver.

23. The broadband repeater of claim 18 wherein said provisioning information prioritizes by the particular type of application being used by one or more users of the network being transmitted by said at least one transmitter.

24. The broadband repeater of claim 18 further comprising a buffer memory for storing received electronic signals or data for processing by said controller.

25. The broadband repeater of claim 18 wherein said at least one receiver receives electronic signals or data by either or both a wireless communication or a wired link.

26. The broadband repeater of claim 18 wherein said at least one transmitter transmits electronic signals or data by wireless communication.

27. The broadband repeater of claim 18 wherein said at least one transmitter transmits electronic signals or data by wired link.

28. The broadband repeater of claim 18 wherein said at least one transmitter transmits electronic signals or data by either or both wireless communication or by wired link.

29. The broadband repeater of claim 18 wherein said at least one receiver and said at least one transmitter and said controller are associated with an AC outlet or a wall fixture.

30. The broadband repeater of claim 18 wherein said controller

permits provisioning information to be modified.

31. The broadband repeater of claim 18 wherein said provisioning information supplied to said controller is communicated using either a wireless or wired link.

32. The broadband repeater of claim 31 wherein said provisioning information is further supplied to said controller by over-the-air ultrawideband signaling.

33. The broadband repeater of claim 31, wherein said provisioning information is further supplied to said controller by a wired connection from another device.

34. The broadband repeater of claim 18 wherein said controller uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones of transmissions or reception.

35. The broadband repeater of claim 18 wherein said controller permits support of position location capabilities for use by a network

36. The broadband repeater of claim 18 wherein said controller directs undesired user or intruder information to be passed to other components of a network from said at least one transmitter using either wireless or wired connectivity.

37. The broadband repeater of claim 18 wherein said transmitter and said receiver have reversible input/output directions.

38. A broadband wireless repeater, comprising:

at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband devices, and at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and

a controller which is either pre-programmed or programmable to collect traffic information or security information related to received and transmitted data, said controller controlling reception of electronic signals or data by said at least one receiver and transmission by said at least one transmitter.

39. The broadband repeater of claim 38 further comprising a means for exporting traffic information or security information to one or more computer processors or devices.

40. The broadband repeater of claim 38 further comprising means for adjusting one or more operations of said controller based on said traffic information or security information.

41. A broadband repeater, comprising:

at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband devices and at least some of said signals being sent by a wired link, and at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at

least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and

a controller for controlling reception of electronic signals by said at least one receiver and transmission by said at least one transmitter,

wherein said controller supports a hub or router function to allow for the commingling of both wireless and wired traffic within said broadband repeater.

42. The broadband repeater of claim 1 wherein either pre-programmed or programmable network information supplied to said controller is communicated using either a wireless or wired link.

43. The broadband repeater of claim 42 wherein said network information is further supplied to said controller by over-the-air ultrawideband signaling.

44. The broadband repeater of claim 42, wherein said network information is further supplied to said controller by a wired connection from another device.

BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES

ABSTRACT OF THE DISCLOSURE

5 An ultrawideband radio transceiver/repeater provides a
low cost infrastructure solution that merges wireless and wired
network devices while providing connection to the plant,
flexible repeater capabilities, network security, traffic
monitoring and provisioning, and traffic flow control for wired
10 and wireless connectivity of devices or networks. The
ultrawideband radio transceiver/repeater can be implemented in
discrete, integrated, distributed or embedded forms.

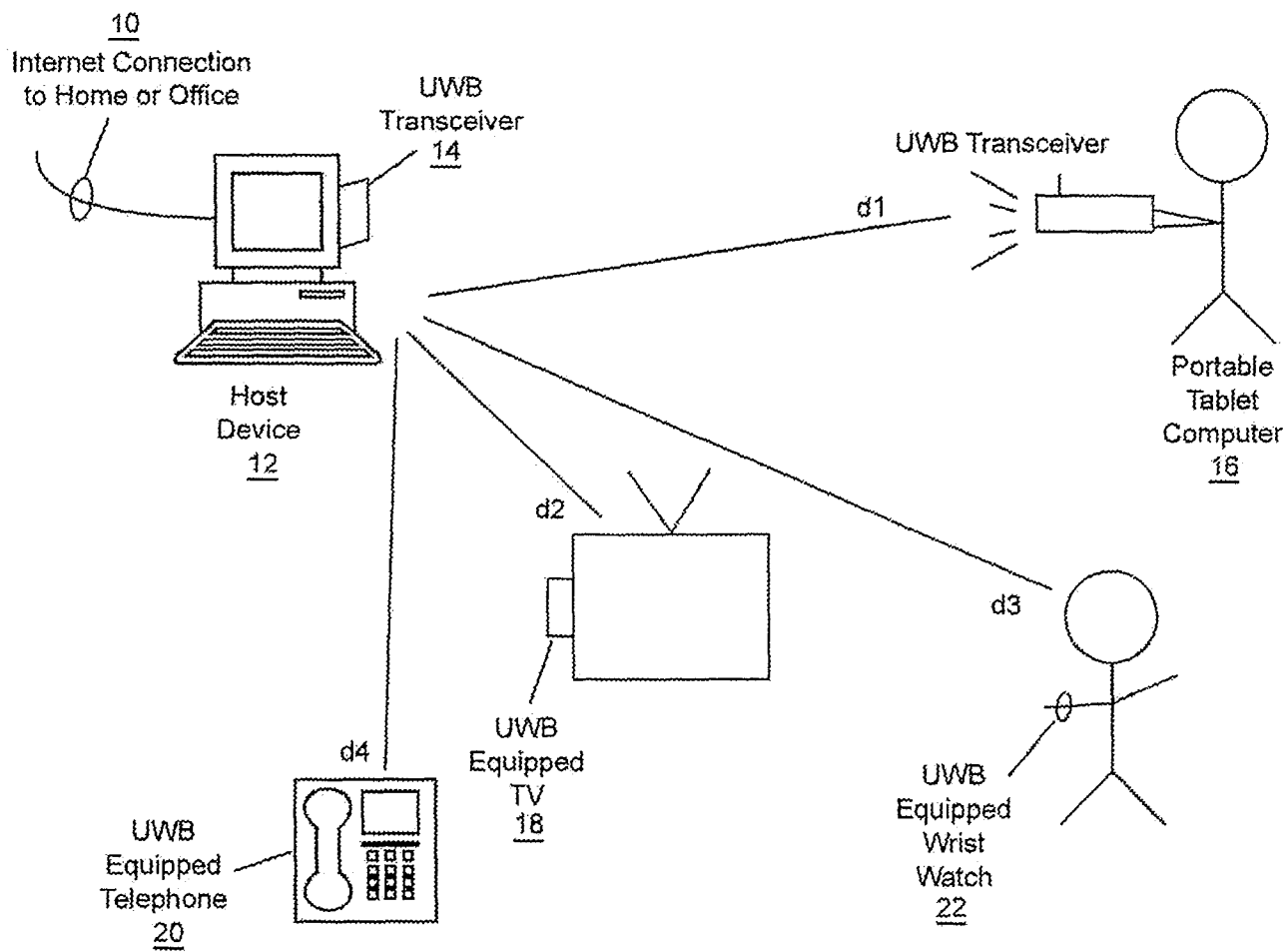


Figure 1

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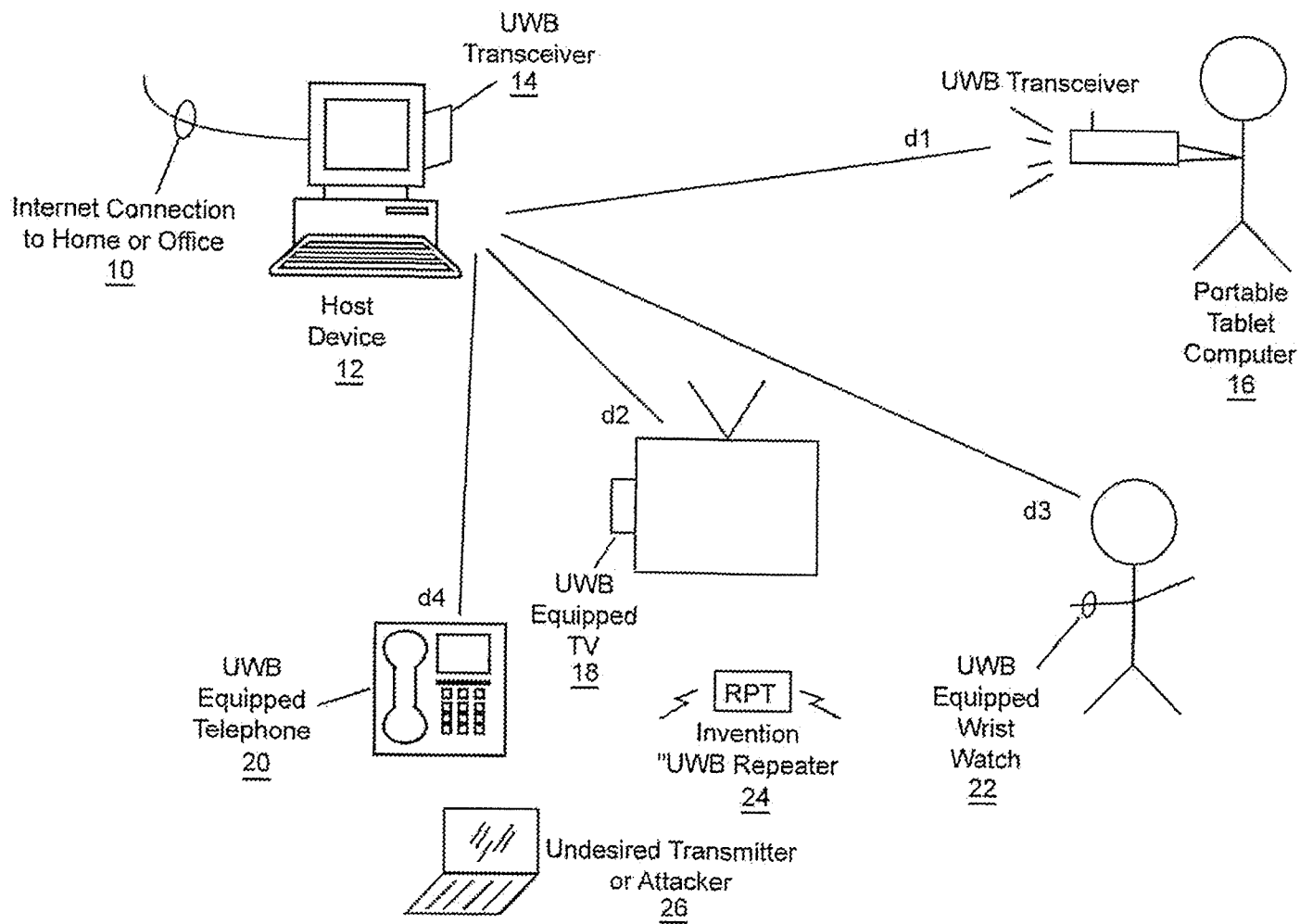


Figure 2

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3/6

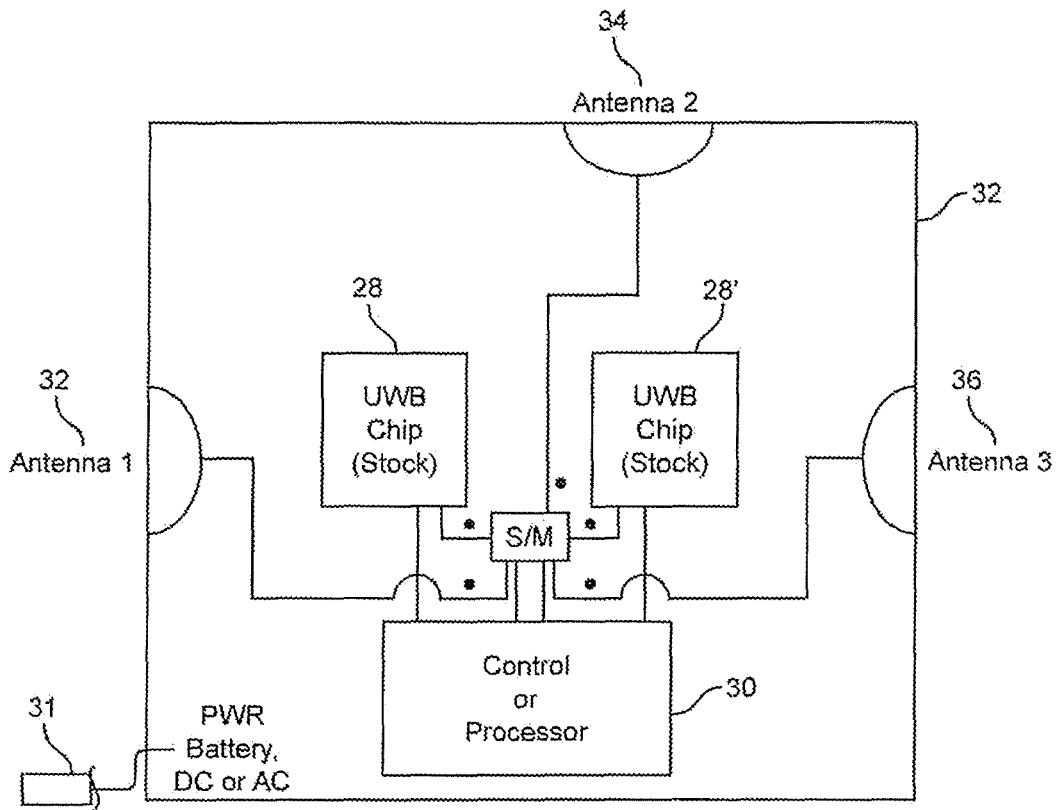


Figure 3

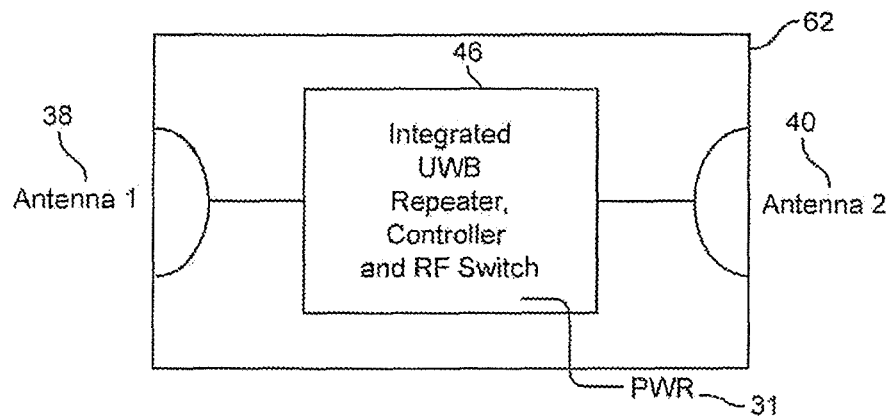


Figure 4

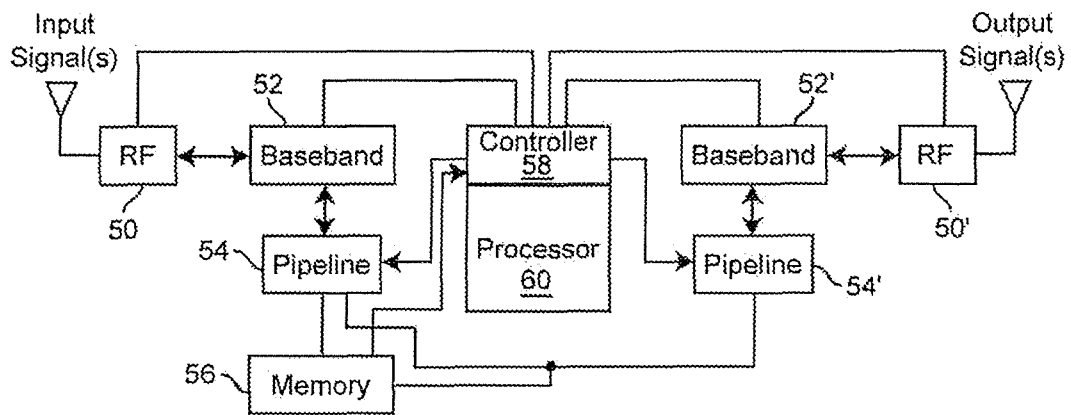


Figure 5

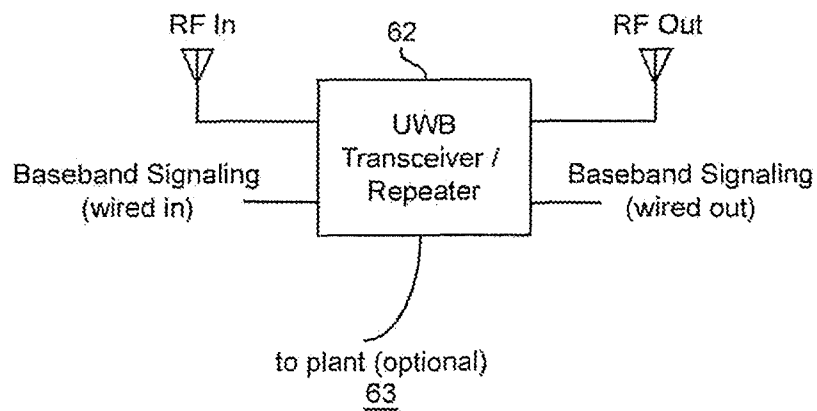


Figure 6

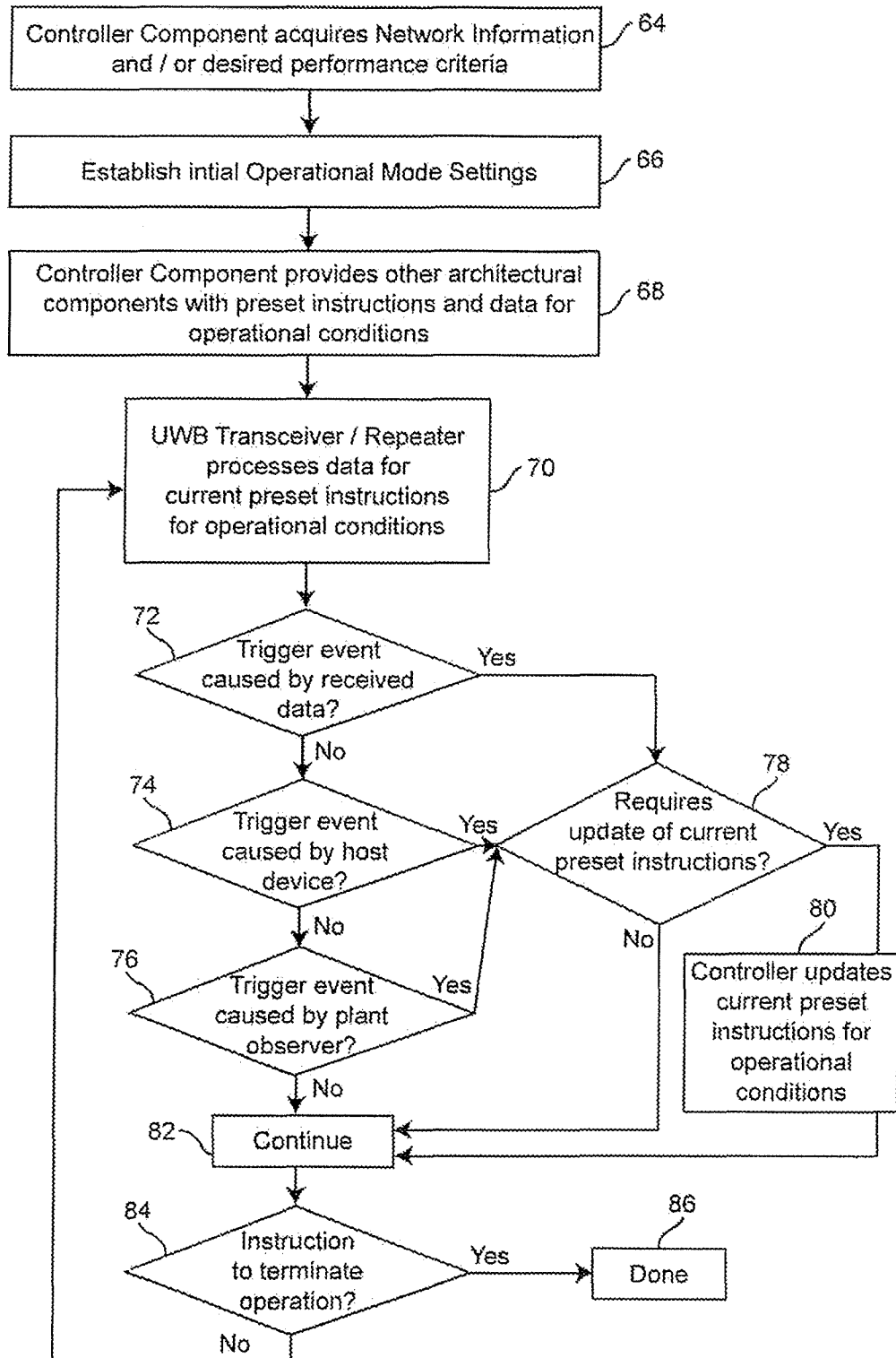


Figure 7

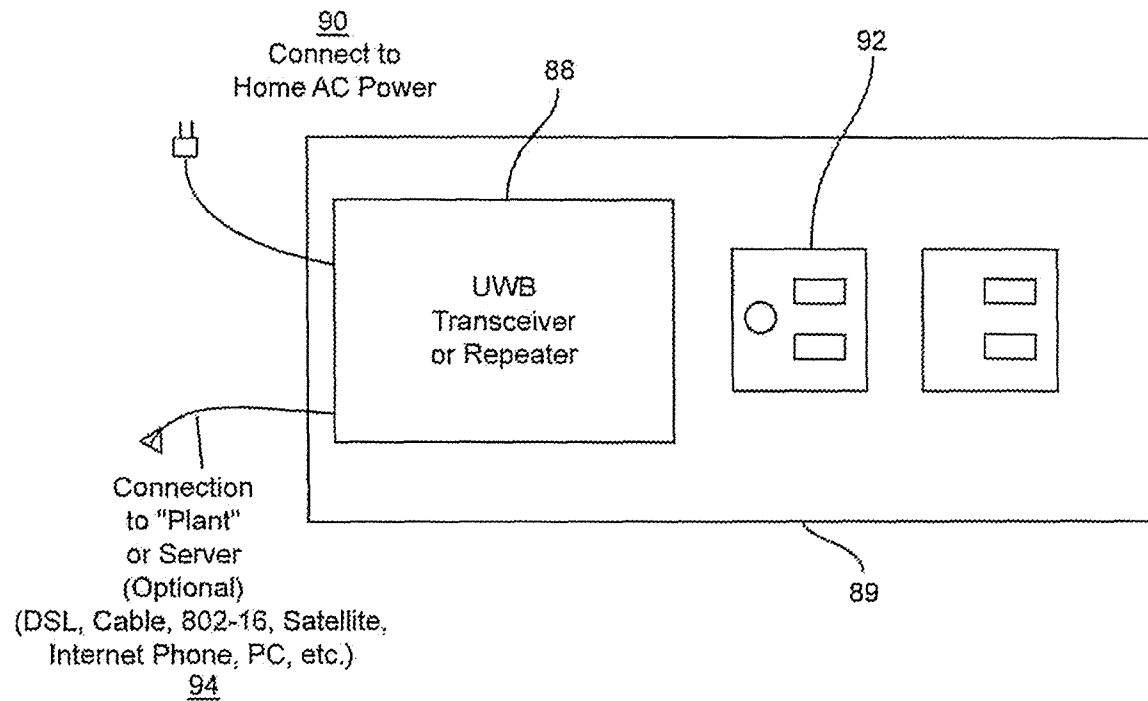


Figure 8

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND
--------------------	--

As the below named inventor, hereby declare that:

This declaration is directed to ☒ The attached application, or

☐ United States application or PCT international application number _____

Filed on _____

The above identified application was made or authorized to be made by me

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application

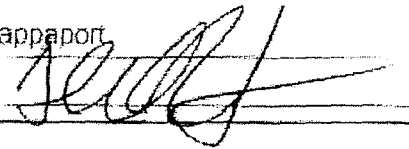
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Theodore S. Rappaport Date (Optional): _____

Signature: 

Note: An application data sheet (PTO/AIA/31 or equivalent) including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/31 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public, which is to be filed 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 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments or suggestions to improve 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: P.O. Box 1450, SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	08610001C10
		Application Number	
Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Inventor Information:

Inventor	1				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
Dr. ☐	Theodore	S.	Rappaport			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
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Address 2						
City	Riner	State/Province	VA			
Postal Code	24149	Country	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.						

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Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐ An Address is being provided for the correspondence Information of this application.	
Customer Number	30743
Email Address	action@wcc-ip.com
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Application Information:

Title of the Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES		
Attorney Docket Number	08610001C10	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	08610001C10
		Application Number	
Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	80743		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15627903	2017-06-20

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		08610001C10	
		Application Number			
Title of Invention		BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES			

Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15627903	Continuation of	14540660	2014-11-13	9722690	2017-08-00
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14540660	Continuation of	13676246	2012-11-14	8918049	2014-12-23
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13676246	Continuation of	13157789	2011-06-10	8331854	2012-12-11
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13157789	Continuation of	12689052	2010-01-18	7983613	2011-06-19
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12689052	Continuation of	10919515	2004-08-17	7676194	2010-03-09
Prior Application Status		Expired		Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
10919515	Claims benefit of provisional	60498324	2003-08-28		
Prior Application Status		Expired		Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
10919515	Claims benefit of provisional	60496913	2003-08-22		
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.				Add	

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	08610001C10
		Application Number	
Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES		

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	08610001C10
	Application Number	
Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	08610001C10
		Application Number	
Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Applicant	1			Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor	
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest		
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor:				
If the Applicant is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Applicant:				
Address 1				
Address 2				
City		State/Province		
Country		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Applicant Data may be generated within this form by selecting the Add button. Add				

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	08610001C10
		Application Number	
Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Michael E. Whitham/		Date (YYYY-MM-DD)	2019-01-16
First Name	Michael	Last Name	Whitham	Registration Number
				32635
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	08610001C10
		Application Number	
Title of Invention	BROADBAND REPEATER WITH SECURITY FOR ULTRAWIDEBAND TECHNOLOGIES		

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

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:

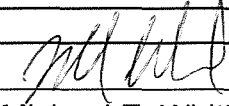
- 1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
- 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 inspections 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.

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UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	08610001C10
	First Named Inventor	T. Rappaport
	Title	BROADBAND REPEATER...
	Priority Mail Express® Label No.	

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
1. ☒ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☐ Applicant asserts small entity status. See 37 CFR 1.27 3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent. 4. ☒ Specification [Total Pages <u>48</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement) 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>6</u>] 6. Inventor's Oath or Declaration [Total Pages <u>1</u>] (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e)) a. ☐ Newly executed (original or copy) b. ☒ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent) 8. CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD 9. 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 PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 11. ☐ 37 CFR 3.73(c) Statement ☐ Power of Attorney (when there is an assignee) 12. ☐ English Translation Document (if applicable) 13. ☒ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☒ Copies of citations attached 14. ☒ Preliminary Amendment 15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized) 16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☐ Other: _____ _____ _____ _____

*Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS).
 (2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS					
☒ The address associated with Customer Number: <u>30743</u> OR ☐ Correspondence address below					
Name					
Address					
City	State	Zip Code			
Country	Telephone	Email			
Signature			Date	1/16/18	
Name (Print/Type)	Michael E. Whitham		Registration No. (Attorney/Agent)	32635	

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.

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

FEE TRANSMITTAL		Complete if known	
☐ Applicant asserts small entity status. See 37 CFR 1.27. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.		Application Number	
		Filing Date	
		First Named Inventor	
		Examiner Name	
		Art Unit	
TOTAL AMOUNT OF PAYMENT	(\$) 1835	Practitioner Docket No.	

METHOD OF PAYMENT (check all that apply)
☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☐ Deposit Account Deposit Account Number: _____ Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to (check all that apply):

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**
☐ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR 1.16 and 1.17 ☐ Credit any overpayment of fee(s)

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.

FEE CALCULATION**1. BASIC FILING, SEARCH, AND EXAMINATION FEES** (U = undiscounted fee; S = small entity fee; M = micro entity fee)

Application Type	FILING FEES			SEARCH FEES			EXAMINATION FEES			Fees Paid (\$)
	U (\$)	S (\$)	M (\$)	U (\$)	S (\$)	M (\$)	U (\$)	S (\$)	M (\$)	
Utility	300	150*	75	660	330	165	760	380	190	785
Design	200	100	50	160	80	40	600	300	150	
Plant	200	100	50	420	210	105	620	310	155	
Reissue	300	150	75	660	330	165	2,200	1,100	550	
Provisional	280	140	70	0	0	0	0	0	0	

* The \$150 small entity status filing fee for a utility application is further reduced to \$75 for a small entity status applicant who files the application via EFS-Web.

2. EXCESS CLAIM FEES

Fee Description	Undiscounted Fee (\$)	Small Entity Fee (\$)	Micro Entity Fee (\$)
Each claim over 20 (including Reissues)	100	50	25
Each independent claim over 3 (including Reissues)	460	230	115
Multiple dependent claims	820	410	205
Total Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
41	-20 or HP = 21	x 50	= 1050
HP = highest number of total claims paid for, if greater than 20.			
Indep. Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
	-3 or HP =	x	=
HP = highest number of independent claims paid for, if greater than 3.			

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$400 (\$200 for small entity) (\$100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

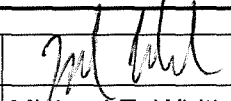
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
- 100 =	/ 50 =	(round up to a whole number) x	=	

4. OTHER FEE(S)

Non-English specification, \$130 fee (no small or micro entity discount)

Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, \$400 fee (\$200 small or micro entity)

Other (e.g., late filing surcharge):

SUBMITTED BY		
Signature 	Registration No. (Attorney/Agent) 32635	Telephone 703-787-9400
Name (Print/Type) Michael E. Whitham	Date 1/12/18	

This collection of information is required by 37 CFR 1.136. 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 30 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Theodore Rappaport	Confirmation No. (not assigned)
Serial No. (not assigned)	Group Art Unit (not assigned)
Filed Concurrently Herewith	Examiner (not assigned)
For BROADBAND REPEATER WITH SERCURITY FOR ULTRA WIDEBAND TECHNOLOGIES	

This application is a continuation application of

Theodore Rappaport	Confirmation No. 2881
Serial No. 15/627,903	Group Art Unit 2464
Filed June 20, 2017	Examiner Patel
For BROADBAND REPEATER WITH SERCURITY FOR ULTRA WIDEBAND TECHNOLOGIES	

The application claims priority to several applications/patents detailed in the applicant data sheet.

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

PRELIMINARY AMENDMENT

Sir:

Prior to calculation of the filing fees and examination on the merits, please amend the above-identified patent application as follows:

Amendments to the Claims: begin on page 2

Remarks: begin on page 9

Listing of the Claims:

The following is a complete listing of all the claims in the application, with an indication of the status of each:

1-44. (Canceled)

45. (new) A wireless network device, comprising:

a wireless transmitter that transmits wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

a wireless receiver that receives wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz;

wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from wireless data that has been received by the wireless receiver;

wherein the wireless network device is configured for processing wireless data received by the wireless receiver, and

wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter.

46. (new) The wireless network device of claim 45 wherein the wireless network device is configured for determining whether any, a portion, or all information in the processed wireless data should be transmitted as wireless data to one or more other devices by the wireless transmitter.

47. (new) The wireless network device of claim 45 wherein the wireless network device is a wireless router.

48. (new) The wireless network device of claim 45 wherein the wireless network device is a wireless access point.

49. (new) The wireless network device of claim 45 wherein the wireless network device is a repeater.

50. (new) The wireless network device of claim 45 wherein the wireless transmitter is configured for transmitting wireless data according to an 802.11 wireless standard.

51. (new) The wireless network device of claim 45 wherein the wireless receiver is configured for receiving wireless data according to an 802.11 wireless standard.

52. (new) The wireless network device of claim 45 wherein the wireless transmitter is configured for transmitting half duplex wireless data and wherein the wireless receiver is configured for receiving half duplex wireless data.

53. (new) The wireless network device of claim 45 wherein the wireless transmitter is configured for transmitting full duplex wireless data and wherein the wireless receiver is configured for receiving full duplex wireless data.

54. (new) The wireless network device of claim 45 wherein the wireless network device is configurable by an interface that is accessible from a computer.

55. (new) The wireless network device of claim 45 wherein the wireless network device comprises two or more antennas.

56. (new) The wireless network device of claim 55 wherein the wireless network device is configured for using MIMO antenna technology.

57. (new) The wireless network device of claim 45 wherein the wireless network device is configured for performing beamforming.

58. (new) The wireless network device of claim 45

wherein the wireless network device comprises an adaptable antenna; and
wherein the wireless transmitter is configured for using the adaptable antenna for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

59. (new) The wireless network device of claim 45

wherein the wireless network device comprises a steerable antenna; and
wherein the wireless transmitter is configured for using the steerable antenna for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

60. (new) The wireless network device of claim 45

wherein the wireless network device comprises an omnidirectional antenna; and

wherein the wireless transmitter is configured for using the omnidirectional antenna for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

61. (new) The wireless network device of claim 45 wherein the wireless network device is configured for operating within a wireless mesh network.

62. (new) The wireless network device of claim 45 wherein the wireless network device is configured for using data encryption when transmitting with the wireless transmitter.

63. (new) The wireless network device of claim 45 wherein the wireless network device is configured for assigning priority levels to at least some wireless data that is to be transmitted by the wireless transmitter.

64. (new) The wireless network device of claim 45 wherein the wireless network device is configured for assigning one or more priority levels to at least some

wireless data that is to be transmitted by the wireless transmitter, wherein at least some of the one or more priority levels are related to one or more levels of a certain quality of service.

65. (new) The wireless network device of claim 45

wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals in more than one frequency band, and

wherein the wireless receiver is configured for receiving wireless data through electromagnetic signals in more than one frequency band.

66. (new) The wireless network device of claim 45 wherein the wireless network device is configured for transmitting beacon frames with the wireless transmitter.

67. (new) The wireless network device of claim 45 wherein the wireless transmitter is configured for transmitting wireless data at more than one data rate.

68. (new) The wireless network device of claim 45 wherein the wireless receiver is configured for receiving wireless data at more than one data rate.

69. (new) The wireless network device of claim 45 wherein the wireless network device is configured to be powered through a connection to a DC power source.

70. (new) The wireless network device of claim 45 wherein the wireless network device is configured to be powered through a connection to an AC power source.

71. (new) The wireless network device of claim 45 wherein the wireless network device is configured to operate in a cellular network.

72. (new) The wireless network device of claim 45 wherein the wireless network device comprises:

a wired connection port which permits a wired internet connection wherein the wireless network device is configured for transmitting and receiving wired data through the wired connection port;

wherein the wireless transmitter is configured for transmitting wireless data that contains information present in or determined from received wired data; and

wherein the wireless network device is configured for transmitting via the wired connection port wired data that contains information present in or determined from wireless data that has been received by the wireless receiver.

73. (new) The wireless network device of claim 72 wherein the wireless network device is configured for processing received wired data and determining whether any, a portion, or all information in the processed wired data should be transmitted as wireless data to one or more other devices by the wireless transmitter.

74. (new) The wireless network device of claim 72 wherein the wireless network device is configured for providing an internet connection to one or more other devices.

75. (new) The wireless network device of claim 72 wherein the wired internet connection is an Ethernet connection.

76. (new) The wireless network device of claim 72 wherein the wired internet connection is a coaxial connection.

77. (new) The wireless network device of claim 72 wherein the wired internet connection is a wired optical cable connection.

78. (new) The wireless network device of claim 45

wherein the wireless transmitter is configured for transmitting wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz; and

wherein the wireless receiver is configured for receiving wireless data through OFDM electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz.

79. (new) The wireless network device of claim 45 wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 100 MHz.

80. (new) The wireless network device of claim 45 wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth of 160 MHz.

81. (new) The wireless network device of claim 45

wherein the wireless transmitter is configured for transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second; and

wherein the wireless receiver is configured for receiving wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz at a data rate greater than or equal to 100 megabits per second and less than or equal to 480 megabits per second.

82. (new) The wireless network device of claim 45 wherein the wireless transmitter and the wireless receiver are both part of a transceiver.

83. (new) A wireless network system, comprising:

one or more wireless network devices as recited in claim 45; and

one or more devices which receive wireless data transmitted by a wireless transmitter of at least one of the one or more wireless network devices.

84. (new) A wireless networking method, comprising:

transmitting wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz with a wireless transmitter that is part of or in communication with a wireless network device;

receiving wireless data through electromagnetic signals that have a bandwidth greater than or equal to 100 MHz and less than or equal to 500 MHz a wireless receiver that is part of or in communication with the wireless network device;

processing wireless data received by the wireless receiver with a processor that is part of or in communication with the wireless network device; and

determining whether any, a portion, or all information in the processed wireless data should be transmitted by the wireless transmitter,

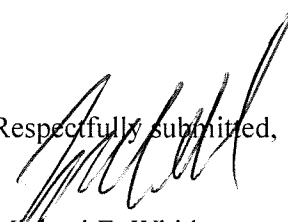
wherein the wireless data transmitted in the transmitting step contains information present in or determined from wireless data that was received by the wireless receiver in the receiving step.

REMARKS

Claims 1-44 have been canceled. Claims 45-84 have been added.

Please calculate the filing fee based on claims 45-84 and proceed to examination on the merits.

Respectfully submitted,



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