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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
09/967,140	7039435	2618	9200

OC000000069877838

Correspondence Address/Fee Address Change

The following fields have been set to Customer Number 24319 on 07/28/2014

- **Correspondence Address**
- **Maintenance Fee Address**

The address of record for Customer Number 24319 is:

24319
LSI CORPORATION
1110 American Parkway NE
Allentown, PA 18109

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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
09/967,140	7039435	2618	9200

OC000000089830681

Correspondence Address/Fee Address Change

The following fields have been set to Customer Number 24319 on 07/25/2014

- **Correspondence Address**
- **Maintenance Fee Address**

The address of record for Customer Number 24319 is:

24319
LSI CORPORATION
1110 American Parkway NE
Allentown, PA 18109

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
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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)

47396 7590 11/18/2005

HITT GAINES, PC
AGERE SYSTEMS INC.
PO BOX 832570
RICHARDSON, TX 75083

03/01/2006 CCHAU2 00000023 09967140

01 FC:1501 1400.00 OP
02 FC:8001 3.00 OP
03 FC:1504 300.00 OP

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

Debbie Sams	(Depositor's name)
Debbie Sams	(Signature)
February 21, 2006	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,140	09/28/2001	Richard L. McDowell	R.L. MCDOWELL 20-76	4925

TITLE OF INVENTION: PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$1700	02/21/2006

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRINH, SONNY	2687	455-522000

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

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

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

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

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Agere Systems Inc. Allentown, PA

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

4a. The following fee(s) are enclosed:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☒ Advance Order - # of Copies 1

4b. Payment of Fee(s):
☒ A check in the amount of the fee(s) is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.
NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature J. Joel Justiss Date February 21, 2006

Typed or printed name J. Joel Justiss Registration No. 48,981

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

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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

47396 7590 11/18/2005

HITT GAINES, PC
AGERE SYSTEMS INC.
PO BOX 832570
RICHARDSON, TX 75083

EXAMINER	
TRINH, SONNY	
ART UNIT	**PAPER NUMBER**
2687	

DATE MAILED: 11/18/2005

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,140	09/28/2001	Richard L. McDowell	R.L. MCDOWELL 20-76	4925

TITLE OF INVENTION: PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$1700	02/21/2006

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 REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. 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.

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

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

PTOL-85 (Rev. 07/05) Approved for use through 04/30/2007.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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47396 7590 11/18/2005

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AGERE SYSTEMS INC.
PO BOX 832570
RICHARDSON, TX 75083

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,140	09/28/2001	Richard L. McDowell	R.L. MCDOWELL 20-76	4925

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APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$1700	02/21/2006

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRINH, SONNY	2687	455-522000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
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2 _____
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Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are enclosed:
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☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

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☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,140	09/28/2001	Richard L. McDowell	R.L. MCDOWELL 20-76	4925

47396 7590 11/18/2005

HITT GAINES, PC
AGERE SYSTEMS INC.
PO BOX 832570
RICHARDSON, TX 75083

EXAMINER	
TRINH, SONNY	
ART UNIT	**PAPER NUMBER**
2687	

DATE MAILED: 11/18/2005

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

The Patent Term Adjustment to date is 575 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 575 day(s).

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

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

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571) 272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

PTOL-85 (Rev. 07/05) Approved for use through 04/30/2007.

Notice of Allowability	Application No.	Applicant(s)	
	09/967,140	MCDOWELL ET AL.	
	Examiner	Art Unit	
	Sonny TRINH	2687	

-- 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 *10/06/05*.

2. ☒ The allowed claim(s) is/are *19-27*.

3. ☒ The drawings filed on *28 September 2001* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of 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. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ 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).

7. ☐ 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)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Sonny Trinh

SONNY TRINH
PRIMARY EXAMINER

Notice of References Cited	Application/Control No. 09/967,140	Applicant(s)/Patent Under Reexamination MCDOWELL ET AL.	
	Examiner Sonny TRINH	Art Unit 2687	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-2005/0124305	06-2005	Stichelbout, Thomas	455/117
	B	US-2004/0203345	10-2004	Tehrani, Mahin Nikmanesh	455/011.1
	C	US-2003/0064761	04-2003	Nevermann, Peter	455/572
	D	US-6,456,856	09-2002	Werling et al.	455/575.5
	E	US-2005/0093624	05-2005	Forrester et al.	330/129
	F	US-2005/0075123	04-2005	Jin et al.	455/522
	G	US-2004/0176125	09-2004	Lee, Ju-Byung	455/522
	H	US-2003/0076168	04-2003	Forrester, Tim	330/129
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Issue Classification	Application/Control No.	Applicant(s)/Patent under Reexamination	
	09/967,140	MCDOWELL ET AL.	
	Examiner	Art Unit	
	Sonny TRINH	2687	

ISSUE CLASSIFICATION

ORIGINAL		CROSS REFERENCE(S)							
CLASS	SUBCLASS	CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)						
455	522	455	575.5	115.1					
INTERNATIONAL CLASSIFICATION									
H04B 07/00									
/									
/									
/									
/									

(Assistant Examiner) (Date)

Linda Bastien 11/19/05

(Legal Instruments Examiner) (Date)

Sonny Trinh

SONNY TRINH
PRIMARY EXAMINER 11-1-05

(Primary Examiner) (Date)

Total Claims Allowed: 9

O.G. Print Claim(s)	O.G. Print Fig.
1	3

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		31		61		91		121		151		181
	2		32		62		92		122		152		182
	3		33		63		93		123		153		183
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9	27		57		87		117		147		177		207
	28		58		88		118		148		178		208
	29		59		89		119		149		179		209
	30		60		90		120		150		180		210

ATTORNEY DOCKET NO. R.L. MCDOWELL 20-76 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Richard L. McDowell, *et al.*
Serial No.:	09/967,140
Filed:	September 28, 2001
Title:	A PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF
Grp./A.U.:	2643
Examiner:	Thai Vu

S.T.

PLEASE ENTER.

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

[redacted]

Sir:

AMENDMENT UNDER 37 C.F.R. § 1.116

The Applicants have carefully considered this application in connection with the Examiner's Final Rejection mailed August 8, 2005, and respectfully request reconsideration of this application in view of the following amendment and remarks.

Index of Claims	Application/Control No. 09/967,140	Applicant(s)/Patent under Reexamination MCDOWELL ET AL.
	Examiner Thai N. Vu	Art Unit 2687

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim Final	Claim Original	Date 07/30/05	Date 10/31/05
	~~1~~	√	–
	~~2~~	√	–
	~~3~~	√	–
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Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
09/967,140	MCDOWELL ET AL.	
Examiner	**Art Unit**	
Thai N. Vu	2687	

SEARCHED			
Class	Subclass	Date	Examiner
455	572	7/30/2005	TV
	127.1		
	115.1		
	550.1		
	300		
	301		
455	569.1	10/31/05	S.T.
	522		
	575.6		
	575.5		
	100		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
455	522	10-31-05	S.T.
455	575.5	"	"
455	115.1	"	"

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Lester Kincaid	07/28/05	TV
East Search	07/30/05	TV

HITT GAINES, P.C.

Intellectual Property Law & Related Matters

FACSIMILE TRANSMISSION

TO: USPTO
Examiner: Thai Vu - Art Unit: 2643

FAX NO. 571-273-8300

FROM: J. Joel Justiss

RE: Serial No.: 09/967,140
Attorney Docket No.: R.L. MCCOWELL 20-76
Amendment Under 37 C.F.R. § 1.116

DATE: October 6, 2005

PAGES: 6 (including cover page)

If you do not receive the indicated number of pages, please notify the sender at the telephone number shown below. Thank you.

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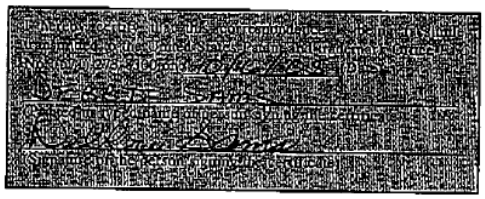
Street Address: Palisades Central II, 2435 North Central Expressway, Suite 1300, Richardson, Texas 75080-2753 U.S.A.
Tel: (972) 480-8800 Fax: (972) 480-8865 firm@hittgaines.com

ATTORNEY DOCKET NO. R.L. MCDOWELL 20-76 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Richard L. McDowell, *et al.*
Serial No.:	09/967,140
Filed:	September 28, 2001
Title:	A PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF
Grp./A.U.:	2643
Examiner:	Thai Vu

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



Sir:

AMENDMENT UNDER 37 C.F.R. § 1.116

The Applicants have carefully considered this application in connection with the Examiner's Final Rejection mailed August 8, 2005, and respectfully request reconsideration of this application in view of the following amendment and remarks.

IN THE CLAIMS:

Claims 1-18 (canceled)

19. (Previously Presented) A portable cell phone, comprising:

a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower; and

a proximity regulation system, including:

a location sensing subsystem that determines a location of said portable cell phone proximate a user; and

a power governing subsystem, coupled to said location sensing subsystem, that determines a proximity transmit power level of said portable cell phone based on said location and determines a transmit power level for said portable cell phone based on said network adjusted transmit power level and said proximity transmit power level.

20. (Previously Presented) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem determines said location with respect to a portion of a body of said user.

21. (Original) The portable cell phone as recited in Claim 19 wherein said proximity transmit power level is limited to a predetermined maximum level.

22. (Original) The portable cell phone as recited in Claim 19 wherein said proximity transmit power level is maximum when said portable cell phone is operating in a headset operation mode or data transfer operation mode.

23. (Original) The portable cell phone as recited in Claim 19 wherein said portable cell phone is located on a belt-clip of said user.

24. (Original) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem or said power governing subsystem is embodied in an integrated circuit.

25. (Previously Presented) The portable cell phone as recited in Claim 19 wherein said proximity transmit power level is reduced to one level when said location is within a vicinity of a user's head and reduced to a second level when said location is within a vicinity of a user's midsection.

26. (Original) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem determines said location by employing a sensor selected from the group consisting of:

a designated sensor,

a contact sensor,

a belt clip sensor, and

a cradle sensor.

27. (Original) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem determines said location by ascertaining a mode of operation of said portable cell phone.

REMARKS/ARGUMENTS

The Applicants originally submitted Claims 1-27 in the application and amended Claims 1-2, 10-11, 19-20 and 25 in a previous response. In the present Final Rejection, the Examiner has indicated that Claims 19-27 are allowed. In order to expedite issuance, the Applicants have canceled Claims 1-18 without prejudice or disclaimer to place the application in condition for allowance. Accordingly, Claims 19-27 are currently pending in the application.

I. Rejection of Claims 1-3, 6-7, 9-12, 15-16 and 18 under 35 U.S.C. §102

The Examiner has rejected Claims 1-3, 6-7, 9-12, 15-16 and 18 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,456,856 to Werling, *et al.* The §102(b) rejection, however, is now moot since the Applicants have canceled Claims 1-3, 6-7, 9-12, 15-16 and 18 without prejudice or disclaimer. Accordingly, the Applicants respectfully request the Examiner to withdraw the §102 rejection and allow issuance of the pending claims.

II. Rejection of Claims 4-5, 8, 13-14 and 17 under 35 U.S.C. §103

The Examiner has rejected Claims 4-5, 8, 13-14 and 17 under 35 U.S.C. §103(a) as being unpatentable over Werling in view of the following U.S. Patents: U.S. Patent No. 6, 195,562 to Pirhonen for Claims 4 and 13; U.S. Patent No. 6,408,187 to Merriam for Claims 5 and 14; and Merriam in further view of U.S. Patent No. 4,636,741 to Mitzlaff for Claims 8 and 17. The §103(a) rejection, however, is now moot since the Applicants have canceled Claims 4-5, 8, 13-14 and 17 without prejudice or disclaimer. Accordingly, the Applicants respectfully request the Examiner to withdraw the §103(a) rejection and allow issuance of the pending claims.

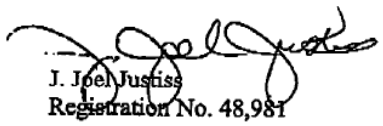
III. Conclusion

In view of the foregoing amendment and remarks, the Applicants now see all of the Claims currently pending in this application to be in condition for allowance and therefore earnestly solicit a Notice of Allowance for Claims 19-27.

The Applicants request the Examiner to telephone the undersigned attorney of record at (972) 480-8800 if such would further or expedite the prosecution of the present application. The Commissioner is hereby authorized to charge any fees, credits or overpayments to deposit account 08-2395.

Respectfully submitted,

HITT GAINES, PC



J. Joel Justiss
Registration No. 48,981

Dated: 10/6/05

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PTO/SB/06 (12-04)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 09/967140

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))							
SEARCH FEE (37 CFR 1.16(k), (i), or (m))							
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))							
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	x =		OR	x =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	x =			x =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 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			TOTAL	

APPLICATION AS AMENDED – PART II

10-6-05

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
AMENDMENT A	Total (37 CFR 1.16(i))	* 9	Minus	** 27	= 0	x =		OR	x =	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT B	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))									
	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 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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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,140	09/28/2001	Richard L. McDowell	R.L. MCDOWELL 20-76	4925

47396 7590 08/08/2005

HITT GAINES, PC
AGERE SYSTEMS INC.
PO BOX 832570
RICHARDSON, TX 75083

EXAMINER	
VU, THAI	
ART UNIT	**PAPER NUMBER**
2687	

DATE MAILED: 08/08/2005

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

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	09/967,140	MCDOWELL ET AL.	
	Examiner	Art Unit	
	Thai N. Vu	2687	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/18/2004*.

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

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

Disposition of Claims

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

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *19-27* is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

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

Application Papers

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

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

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

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

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

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

a)☐ All b)☐ Some * c)☐ None of:

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

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

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

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

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *05/24/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

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

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 6-7, 9-12, 15-16 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Werling et al. (U.S. Patent #: 6,456,856; hereinafter "Werling").

Regarding claim 1, Werling teaches a system for use with a portable cell phone, a proximity regulation system (FIG. 1), comprising:

a location sensing subsystem configured to determine a location of said portable cell phone with respect to a portion of a body of a user (i.e. the proximity detector noted in FIG. 1, block 18; column 3, lines 1-14 – inherently, the detector is capable of distinguishing areas having different heat or humidity signatures, e.g. bare skin areas emits more heat or higher humidity than clothed areas); and

a power governing subsystem, coupled to said location sensing subsystem, configured to determine a proximity transmit power level of said portable cell phone based on said location (FIG. 1, block 17; column 3, lines 15-18).

Regarding claim 2, Werling teaches limitations of the claim in column 3, lines 1-19; column 4, lines 16-36 (i.e. with different areas of the user body provides, detector provides different data value resulting in different transmit power values).

Regarding claim 3, Werling teaches limitations of the claim in column 4, lines 36-60 (i.e. P_{MAX}).

Regarding claim 6, Werling further teaches limitations of the claim in FIG.1, block 17 and column 2, lines 54-66 (i.e. Micro controllers which are widely available as integrated circuits).

Regarding claim 7, Werling further teaches limitations of the claim in FIG. 4 and column 4, lines 40-60.

Regarding claim 9, Werling further teaches limitations of the claim in column 3, lines 1-14.

Regarding claim 10, Werling teaches a method of operating a portable cell phone, comprising:

determining a location of said portable cell phone with respect to a portion of a body of a user (i.e. based on temperature and humidity, the proximity can be determined, column 3, lines 1-14 - inherently, the detector is capable of distinguishing areas having different heat or humidity signatures, e.g. bare skin areas emits more heat or higher humidity than clothed areas);

providing a control signal based on said location (i.e. control signal provided by a microcontroller in FIG. 1, column 3 lines 15-18) ; and

determining a proximity transmit power level of said portable cell phone based on said control signal (FIG. 1 block 16, column 3, lines 15-18).

Regarding claim 11, Werling teaches limitations of the claim in column 3, lines 1-14 (i.e. with different areas of the user body provides, detector provides different data value resulting in different transmit power values).

Regarding claim 12, Werling teaches limitations of the claim in column 4, lines 36-60 (i.e. P_{MAX}).

Regarding claim 15, Werling further teaches limitations of the claim in FIG.1, block 17 and column 2, lines 54-66 (i.e. Micro controllers which are widely available as integrated circuits).

Regarding claim 16, Werling further teaches limitations of the claim in FIG. 4 and column 4, lines 40-60.

Regarding claim 18, Werling further teaches limitations of the claim in column 3, lines 1-14.

Claim Rejections - 35 USC § 103

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

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

5. Claims 4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werling (U.S. Patent #: 6,456,856) in view of Pirhonen et al. (US Patent #: 6,195,562; hereinafter "Pirhonen").

Regarding claims 4 and 13, Werling teaches all subject matter as claimed above except for proximity transmit power level being maximum when said portable cell phone is operating in a headset operation mode or data transfer operation mode. However, Pirhonen teaches such limitations in column 2, lines 29-37 for the purpose of achieving high speed data transmission.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of proximity transmit power level being maximum when said portable cell phone is operating in a data transfer operation mode, as taught by Pirhonen, in view of Werling, in order to achieve high speed data transmission.

6. Claims 5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werling (U.S. Patent #: 6,456,856) in view of Merriam (U.S. Patent #: 6,408,187; hereinafter "Merriam").

Regarding claims 5 and 14, Werling teaches all subject matter as claimed above except for portable cell phone being located on a belt-clip of the user. However, Merriam teaches such limitations in column 3, lines 36-49 for the purpose of indicating whether the device within relatively close proximity to a user.

Therefore, it would have been obvious to one of ordinary skill in the art at

the time the inventions was made to incorporate the use of portable cell phone being located on a belt-clip of the user, as taught by Merriam, in view of Werling, in order to determine the behavior of the communications device.

7. Claims 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werling et al. (U.S. Patent #: 6,456,856) in view of Merriam (U.S. Patent #: 6,408,187) and Mitzlaff (U.S. Patent #: 4,636,741; hereinafter "Mitzlaff").

Regarding claims 8 and 17, Werling teaches all subject matter as claimed above. Werlington further teaches location sensing subsystem determining said location by employing a sensor selected from the group consisting of:

a designated sensor (column 3, lines 1-14),

a contact sensor (i.e. heat/humidity sensor is used to detect a contact with human skin, column 3, lines 1-14)

It should be noticed that Werlington fails to clearly teach a belt clip sensor. However, Merriam teaches such limitations in column 3, lines 36-49 for the purpose of indicating whether the device within relatively close proximity to a user.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of a belt clip sensor, as taught by Merriam, in view of Werlington, in order to determine the behavior of the mobile unit.

It should be further noticed that Werlington and Merriam, in combination, fails to clearly teach a cradle sensor. However, Mitzlaff teaches such limitations in the abstract for the purpose of detecting the presence of the Mobile unit.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of a cradle sensor, as taught by Mitzlaff, into view of Werlington and Merriam, in order to adjust the transmission power accordingly.

Allowable Subject Matter

8. Claims 19-27 are allowed.

9. The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach the feature of a portable cell phone, comprising:

a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower; and

a proximity regulation system, including:

a location sensing subsystem that determines a location of said portable cell phone proximate a user; and

a power governing subsystem, coupled to said location sensing subsystem, that *determines a proximity transmit power level of said portable cell phone based on said location and determines a transmit power level for said portable cell phone based on said network adjusted transmit power level and said proximity transmit power level.*

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thai N. Vu whose telephone number is 571-272-7928. The examiner can normally be reached on 9:00AM-7:00PM, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on 571-272-7922. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SONNY TRINH
PRIMARY EXAMINER

Thai N. Vu
Examiner
Art Unit 2687

PTO/SB/08A (08-03)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	09/967,140
Filing Date	September 28, 2001
First Named Inventor	Richard L. McDowell
Art Unit	2643
Examiner Name	Thai Vu
Attorney Docket Number	R.L. MCDOWELL 20-76

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
✓		WO 02/05443 A2	01/17/2002	Irvin, et al.		

Examiner Signature		Date Considered	07/20/05

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Notice of References Cited	Application/Control No. 09/967,140	Applicant(s)/Patent Under Reexamination MCDOWELL ET AL.	
	Examiner Thai N. Vu	Art Unit 2687	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-6,456,856 B1	09-2002	Werling et al.	455/575.5
	B	US-6,195,562 B1	02-2001	Pirhonen et al.	455/553.1
	C	US-6,408,187 B1	06-2002	Merriam, Charles	455/458
	D	US-4,636,741	01-1987	Mitzlaff, James E.	455/573
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NON-PATENT DOCUMENTS

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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
09/967,140	MCDOWELL ET AL.
Examiner	**Art Unit**
Thai N. Vu	2687

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
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Claim		Date
Final	Original	07/30/05
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Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination
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Examiner	**Art Unit**
Thai N. Vu	2687

SEARCHED			
Class	Subclass	Date	Examiner
455	572	7/30/2005	TV
	127.1		
	115.1		
	550.1		
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INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Lester Kincaid	07/28/05	TV
East Search	07/30/05	TV

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DOCKET NO. R.L. MCDOWELL 20-76 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Richard L. McDowell, et al.
Serial No.:	09/967,140
Filed:	September 28, 2001
For:	A PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF
Group:	2643
Examiner:	Thai Vu

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

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(Signature of the person signing the certificate)
05/19/05
(Date of Signature)

INFORMATION DISCLOSURE STATEMENT

In accordance with 37 C.F.R. §1.56 and the provisions of 37 C.F.R. §§1.97 and 1.98 and §609 of the Manual of Patent Examining Procedure, Applicant hereby makes a disclosure of the patents, publications and other information listed below and on the accompanying form IDS by Applicant, which may be potentially material to the patentability of the invention disclosed in the above-referenced application. Pursuant to § 1.97(e) the Applicant hereby states that each item of

information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application. A copy of the listed reference is submitted herewith. A disclosures was previously filed on October 1, 2002.

Foreign Publication No.	Country	Date
WO 02/05443 A2	WO/PCT	January 17, 2002

A copy of the above reference was previously filed with the previous disclosure but was not listed on Form PTO/SB/08A.

As attorney for the Applicant, I am signing below on the basis of the information supplied by an individual designated in § 1.56(c).

The Commissioner is hereby authorized to charge any fees connected with this communication or credit any overpayment to Deposit Account No. 08-2395.

Respectfully submitted,

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Registration No. 48,981

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PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 January 2002 (17.01.2002)

PCT

(10) International Publication Number
WO 02/05443 A2

(51) International Patent Classification[7]: H04B 1/00

(21) International Application Number: PCT/US01/41059

(22) International Filing Date: 20 June 2001 (20.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/612,034 7 July 2000 (07.07.2000) US

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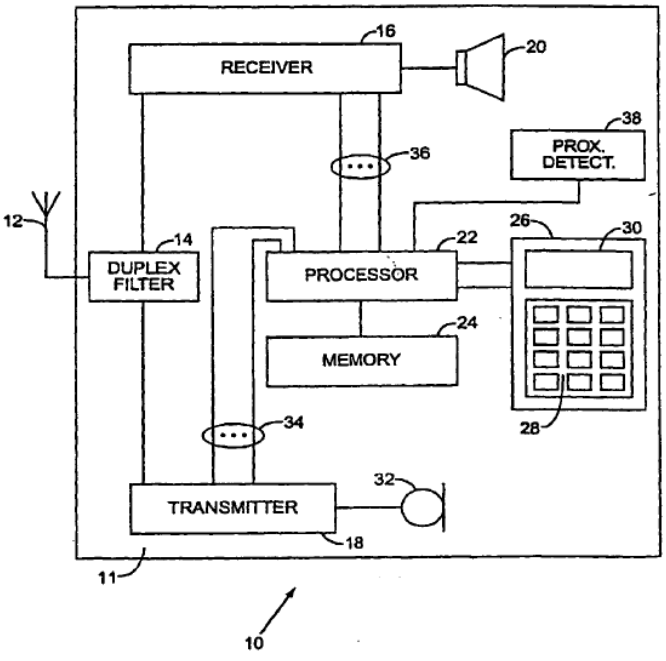
(74) Agents: **BENNETT, David, E.** et al.; Coats & Bennett, PLLC, Post Office Box 5, Raleigh, NC 27602 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PORTABLE COMMUNICATION DEVICE WITH RF OUTPUT POWER CAPPED WHEN THE DEVICE OPERATES IN VERY CLOSE PROXIMITY TO A HUMAN BODY



(57) Abstract: A mobile terminal used in a wireless communication system is operable to limit transmitter power if proximate a human body. The mobile terminal includes a housing. A transmitter in the housing is connected to an antenna. The transmitter has a power control loop controlling transmitter power. A detector detects if the housing is proximate a human body. A control is operatively connected to the transmitter power control loop and to the detector, the control limiting transmitter power if the detector detects that the housing is proximate a human body.

WO 02/05443 A2

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PORTABLE COMMUNICATION DEVICE WITH RF OUTPUT POWER CAPPED WHEN THE DEVICE OPERATES IN VERY CLOSE PROXIMITY TO A HUMAN BODY

FIELD OF THE INVENTION

This invention relates to a mobile terminal used in a wireless communication system and, more particularly, to a mobile terminal operable to limit transmitter power if proximate a human body.

BACKGROUND OF THE INVENTION

A mobile terminal used in wireless communication systems, such as cellular telephone systems, is generally a portable device. In fact, mobile terminals are becoming small enough to fit into a user's pocket, and therefore be very close to the user's body. The mobile terminal includes a transmitter for transmitting a radio frequency (RF) signal through the air.

In a cellular communication system the mobile terminal conducts radio communications with a base station located proximate the mobile terminal. Cellular communication systems include control systems for limiting power. Typically, the base station instructs the mobile terminal to use the least power to avoid interference with other mobile terminals. The base station does so by measuring signal strength and returning instructions to the mobile terminal to modify transmitter power output.

While conducting a voice call, the mobile terminal is placed in a "talk" position next to the user's head. Although there is no basis for concerns regarding an antenna being proximate the user, for psychological comfort the user can hold the mobile terminal spaced away or at an angle so that the antenna is farther from the user's head. Mobile

terminals are also used to provide wireless connection for personal computers and the like to gain access to the Internet. With smaller mobile terminals the user might slip the mobile terminal into a shirt pocket or the like while the call is being conducted.

Again, to provide psychological comfort regarding RF transmitters being very close to a human body, there is a need to control RF power output under such situations.

SUMMARY OF THE INVENTION

In accordance with the invention, there is provided a mobile terminal that caps or limits RF power output when the mobile terminal is very close to the user, and yet permit the mobile terminal to operate without a power cap otherwise.

Broadly, there is disclosed herein a portable communication device operable to limit transmitter power if proximate a human body. The device includes a housing. A transmitter in the housing is connected to an antenna. A detector detects if the housing is proximate a human body. A control is operatively connected to the transmitter and to the detector. The control controls transmitter power and limits transmitter power if the detector detects that the housing is proximate a human body.

It is a feature of the invention that the transmitter is connected to the antenna through a circulator and the detector senses reflected power from the circulator.

It is another feature of the invention that the transmitter is connected to the antenna through a directional coupler and the detector measures voltage standing wave ratio using the directional coupler.

It is a further feature of the invention that the control comprises a programmed processor and the detector is implemented by the programmed processor.

It is yet another feature of the invention that the detector comprises a photo detector proximate an opening in the housing. The photo detector is proximate a speaker

opening in the housing so that if the device is in a "talk" position next to a user's head, then amount of light at the photo detector decreases.

It is still another feature of the invention that the detector comprises a touch-sensitive detection circuit. The detection circuit comprises a conductive element proximate speaker openings in the housing so that if a device is in a "talk" position next to a user's head, then the conductive element is in contact with the user's head.

It is still a further feature of the invention that the portable communication device comprises an AMPS mobile terminal and the controller resets a mobile attenuation code if the detector detects that the housing is proximate a human body

It is still an additional feature of the invention that the control integrates transmitter power if the detector detects that the housing is proximate a human body and limits transmitter power after the integrated transmitter power exceeds a select threshold.

There is disclosed in accordance with another aspect of the invention a mobile terminal used in a wireless communication system and operable to limit transmitter power if proximate a human body. The mobile terminal includes a housing. A transmitter in the housing is connected to an antenna. The transmitter has a power control loop controlling transmitter power. A detector detects if the housing is proximate a human body. A control is operatively connected to the transmitter power control loop and to the detector, the control limiting transmitter power if the detector detects that the housing is proximate a human body. Further features and advantages of the invention will be readily apparent from the specification and from the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of a mobile terminal in accordance with the invention;

Fig. 2 is a general block diagram of the mobile terminal of Fig. 1 specifically illustrating the power limiting feature of the invention;

Fig. 3 is a flow diagram illustrating a program implemented in the processor of Fig. 1 for limiting transmitter power output;

Fig. 4 is a flow diagram illustrating a program implemented in the processor of Fig. 1, in accordance with an alternative embodiment of the invention, for limiting transmitter power output;

Fig. 5 is a block diagram, similar to Fig. 2, illustrating a detector according to a first embodiment of the invention;

Fig. 6 is a block diagram, similar to Fig. 2, illustrating a detector according to a second embodiment of the invention;

Fig. 7 is a front elevation view of a mobile terminal including a detector according to a third embodiment of the invention;

Fig. 8 is a sectional view taken along the line 8-8 of Fig. 7;

Fig. 9 is a front elevation view of a mobile terminal including a detector according to a fourth embodiment of the invention; and

Fig. 10 is a sectional view taken along the line 10-10 of Fig. 9.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is a block diagram of a typical mobile terminal shown generally at 10. The mobile terminal includes a housing 11, an antenna 12, a receiver 16, a transmitter 18, a speaker 20, a processor 22, a memory 24, a user interface 26 and a microphone 32. The antenna 12 is mounted to and can be extended from the housing 11. Alternatively, the antenna 12 could be internal to the housing 11. The antenna 12 is configured to send and receive radio signals between the mobile terminal 10 and a wireless network (not shown),

such as a cellular communications system. The antenna 12 is connected to a duplex filter 14 which enables the receiver 16 and the transmitter 18 to receive and broadcast, respectively, on the same antenna 12. The receiver 16 demodulates, demultiplexes and decodes the radio signals into one or more channels. Such channels includes a control channel and a traffic channel for speech or data. The speech or data are delivered to the speaker 20 (or other output device, such as a modem or fax connector).

The receiver 16 delivers messages from the control channel to the processor 22. The processor 22 controls and coordinates the functioning of the mobile terminal 10 responsive to messages on the control channel using programs and data stored in the memory 24, so that the mobile terminal 10 can operate within the wireless network. The processor 22 also controls the operation of the mobile terminal 10 responsive to input from the user interface 26. The user interface 26 includes a keypad 28 as a user-input device and a display 30 to give the user information. Other devices are frequently included in the user interface 26, such as lights and special purpose buttons. The processor 22 controls the operations of the transmitter 18 and the receiver 16 over control lines 34 and 36, respectively, responsive to control messages and user input.

The microphone 32 (or other data input device) receives speech signal input and converts the input into analog electrical signals. The analog electrical signals are delivered to the transmitter 18. The transmitter 18 converts the analog electrical signals into digital data, encodes the data with error-detection and correction information and multiplexes this data with control messages from the processor 22. Alternatively, the mobile terminal 10 may be connected to a laptop computer or the like which transfers digital signals to the transmitter 18. The transmitter 18 modulates this combined data stream and broadcasts the resultant radio signals to the wireless network through the duplex filter 14 and the antenna 12.

In accordance with the invention, the mobile terminal 10 includes a proximity detector 38 for detecting if the housing 11, and thus antenna 12, is proximate a human body. The detector 38 is operatively connected to the processor 22. The processor 22 operates in accordance with a control program, as described more specifically below, to limit or cap transmitter power output if the antenna 12 is proximate a human body. Particularly, the power is capped, rather than reduced, so that a power control loop operates properly when the expected transmitter power falls below the cap even though the antenna 12 is proximate the user.

Referring to Fig. 2, a block diagram illustrates the power limiting aspect of the invention. Particularly, the transmitter 18 is expanded to generally illustrate a power control loop 40 for controlling transmitter power output. A baseband block 42 generates an RF signal to be transmitted. The RF signal is provided to an RF driver stage 44. The RF driver stage 44 supplies sufficient signal level to a power amplifier 46. The power amplifier 46 amplifies the signal and provides it to the antenna 12.

The driver stage 44 and power amplifier 46 are operatively connected to the processor 22. The processor 22 conventionally controls operation of the driver stage 44 and power amplifier 46 to control transmitter power output.

In an advanced mobile phone system (AMPS), for example, the base station with which the mobile terminal 10 is communicating transmits a mobile attenuation code (MAC) identifying one of eight power levels. The processor 22 controls the power control loop 40 so that power output satisfies the MAC.

In accordance with the invention, the processor 22 implements a logic function so that if the proximity detector 38 senses that the antenna 12 is proximate the user, then the processor 22 establishes a power level cap that the power amplifier 46 is not permitted to exceed. For example, in an AMPS mobile terminal, mobile attenuation codes 000, 001,

010 and 011 could be reset to 100 if the antenna 12 is near the user. This establishes a 100-milliwatt power cap on the power amplifier 46. The other mobile attenuation codes, i.e., 100, 101, 110 and 111, would be processed unaltered, regardless of proximity to the user, as the power output amounts generated from these codes are less than the cap.

As is apparent, the power limiting feature of the invention is not limited to AMPS mobile terminals. This feature can be used with other types of mobile terminals by limiting transmitter power output using codes or commands particular to the particular type mobile terminal.

In a first aspect of the invention, the processor 22 intervenes instantaneously in the power control loop 40. Thus, as soon as proximity is detected by the detector 38, then transmit power is capped. This is illustrated in the flow diagram of Fig. 3.

The flow diagram begins at a block 50 that checks proximity using the proximity detector 38. A decision block 52 determines if the antenna 12 is proximate a user. If not, then a decision block 54 determines if power was previously capped. If not, then control loops back to the block 50. If so, then the power cap is undone at a block 56 and control then loops back to the block 50.

If the antenna 12 is proximate the user, as determined at the decision block 52, then a decision block 58 determines if power is greater than a select threshold. The threshold can be a factory-set value or user-set value that defines the power cap. In the example discussed above, the threshold is 100 milliwatts, represented by MAC 100. If power is not greater than the threshold, then it is not necessary to limit or cap power output and control loops back to the block 50. If power is greater than the threshold, then power is capped at a block 60. The power is capped by reducing the power command signals to the driver stage 44 and/or the power amplifier 46, see Fig. 2. Control then loops back to the block 50.

In accordance with a second aspect of the invention power is integrated as by accumulating sample values over time before the processor 22 intervenes. In this aspect of the invention, energy, represented by power over a specified integration interval, is the driving factor rather than power. This aspect is illustrated by the flow diagram of Fig. 4.

The flow diagram begins at a block 70 which awaits transmitter activity along with a decision block 72. If there is no activity, then control continually loops between the block 70 and the decision block 72. If there is transmitter activity, then a block 74 starts a clock. The clock is used to set a specified integration interval. A block 76 performs the integration by accumulating the product of power and time. A decision block 78 determines if the accumulated amount is greater than a select threshold. If so, then power is capped at a block 80 and the routine ends. If the accumulated amount is not greater than the select threshold, then a decision block 82 determines if the transmitter is active. If not, then the clock and accumulator are reset at a block 84 and control loops back to the block 70. If the transmitter is active, then a decision block 86 determines if the loop has reached the end of a time-based interval. If not, then control loops back to block 76 to continue the integration function. If so, then the accumulator is reset at a block 88 and control loops back to the block 76 to begin another integration interval.

The block diagram of Fig. 2 is a functional diagram illustrating power limitation in accordance with the invention. Specific embodiments for detecting proximity are illustrated below relative to Figs. 5-10. Elements corresponding to those in Fig. 2 are identified with like reference numerals and are not described in detail.

Referring initially to Fig. 5, it is known that close proximity to the user's body detunes the mobile terminal's antenna 12. In this embodiment a circulator 90 is connected between the power amplifier 46 and the antenna 12. Reflected power from the circulator 90 is measured by the processor 22. The processor 22 compares reflected power with a

select threshold. When reflected power exceeds the select threshold, then the processor 22 detects that the antenna 12 is proximate a human body.

Referring to Fig. 6, a functional block diagram illustrates a second embodiment for proximity detection. In the embodiment of Fig. 6, the power amplifier 46 is connected to the antenna 12 through directional couplers 92. The directional couplers are operatively connected to the processor 22. The processor 22 measures the voltage standing wave ratio (VSWR) using the directional couplers 92. When the VSWR exceeds a select threshold, then the processor 22 detects that the antenna 12 is proximate a human body. The VSWR is computed in accordance with the following:

$$VSWR = \frac{V_F + V_R}{V_F - V_R} = \frac{1 + \sqrt{\frac{P_R}{P_F}}}{1 - \sqrt{\frac{P_R}{P_F}}}$$

where V_F is forward voltage, V_R is reflected voltage, P_F is forward power and P_R is reflected power.

In either embodiment of Fig. 5 or Fig. 6, the processor 22 controls the power control loop 40 by establishing a power level cap that the power amplifier 46 is not permitted to exceed, as discussed above relative to Figs. 3 and 4.

Referring to Fig. 7, the mobile terminal housing 11 includes openings 94 for the speaker 20, see Fig. 1, and an opening 96 for a photodetector 98. As shown in Fig. 8, the speaker 20 and photo detector 98 are mounted to a printed circuit board 100 in the housing 11.

The photo detector 98 uses a photo-conductive element, such as cadmium selanide, whose electrical resistance decreases as incident illumination increases. The change in resistance can be detected by the processor 22, see Fig. 1, to function as a proximity detector.

The photo detector opening 96 allows light to pass through the housing 11 to the photo detector 98, as shown generally in Fig. 8. When the mobile terminal 10 is placed in the "talk" position next to the user's head, then the amount of light to the photo detector 98 decreases. The detection of this decrease in light, representing proximity of the housing 11 to a human body, can be used by the processor 22 to cap or limit output power, as discussed above. With the exception of total darkness, there is always a decrease in light when the phone is placed next to the user's head. As is apparent, if the housing 11 is proximate the user's head, then the antenna 12 is also proximate the user's head.

Alternatively, the embodiment of Fig. 7 may be operable to detect the presence of a user by incorporating a photo-conductive element that is sensitive to infrared, i.e., the thermal output of a user.

Referring to Figs. 9 and 10, the mobile terminal 10 uses proximity detection in accordance with a fourth embodiment of the invention. The housing includes a conductive element 102 surrounding the speaker openings 94. In the illustrated embodiment of the invention, the conductive element 102 is a metallic ring. The ring 102 is connected to a touch-sensitive detection circuit 104 mounted on the printed circuit board 100. When the mobile terminal 10 is placed in the "talk" position next to the user's head, then the metallic ring 102 comes in contact with the user's ear. The touch-sensitive detection circuit 104 senses this change in contact and sends a signal to the processor 22 for capping or limiting power output, as discussed above.

Thus, in accordance with the invention a proximity detector and logic functions are used for capping or limiting transmitted power output responsive to an indication of close proximity to a human body

CLAIMS

WE CLAIM:

1. A portable communication device operable to limit transmitter power if proximate a human body, comprising:

an antenna;

a transmitter connected to the antenna;

a detector for detecting if the antenna is proximate a human body; and

a control operatively connected to the transmitter and to the detector, the control controlling transmitter power and limiting transmitter power if the detector detects that the antenna is proximate a human body.

2. The portable communication device of claim 1 wherein the transmitter is connected to the antenna through a circulator and the detector senses reflected power from the circulator.

3. The portable communication device of claim 1 wherein the transmitter is connected to the antenna through a directional coupler and the detector measures voltage standing wave ratio using the directional coupler.

4. The portable communication device of claim 1 wherein the control comprises a programmed processor and the detector is implemented by the programmed processor.

5. The portable communication device of claim 1 further comprising a housing and wherein the detector comprises a photo detector proximate an opening in the housing.

6. The portable communication device of claim 5 wherein the photo detector is proximate a speaker opening in the housing so that if the device is in a talk position next to a users head, then amount of light at the photo detector decreases.

7. The portable communication device of claim 1 further comprising a housing and wherein the detector comprises a touch-sensitive detection circuit.

8. The portable communication device of claim 7 wherein the detection circuit comprises a conductive element proximate speaker openings so that if the device is in a talk position next to a users head, then the conductive element is in contact with the users head.

9. The portable communication device of claim 1 wherein the portable communication device comprises a cellular mobile terminal and the control resets a mobile attenuation code if the detector detects that the antenna is proximate a human body.

10. The portable communication device of claim 1 wherein the control integrates transmitter power if the detector detects that the antenna is proximate a human body and limits transmitter power after the integrated transmitter power exceeds a select threshold.

11. A mobile terminal used in a wireless communication system and operable to limit transmitter power if proximate a human body, comprising:

an antenna;

a housing;

a transmitter in the housing connected to the antenna, the transmitter having a power control loop controlling transmitter power;

a detector for detecting if the antenna is proximate a human body; and

a control operatively connected to the transmitter power control loop and to the detector, the control limiting transmitter power if the detector detects that the antenna is proximate a human body.

12. The mobile terminal of claim 11 wherein the transmitter is connected to the antenna through a circulator and the detector senses reflected power from the circulator.

13. The mobile terminal of claim 11 wherein the transmitter is connected to the antenna through a directional coupler and the detector measures voltage standing wave ratio using the directional coupler.

14. The mobile terminal of claim 11 wherein the control comprises a programmed processor and the detector is implemented by the programmed processor.

15. The mobile terminal of claim 11 wherein the detector comprises a photo detector proximate an opening in the housing.

16. The mobile terminal of claim 15 wherein the photo detector is proximate a speaker opening in the housing so that if the device is in a talk position next to a user's head, then amount of light at the photo detector decreases.

17. The mobile terminal of claim 11 wherein the detector comprises a touch-sensitive detection circuit.

18. The mobile terminal of claim 17 wherein the detection circuit comprises a conductive element proximate speaker openings in the housing so that if the device is in a talk position next to a users head, then the conductive element is in contact with the users head.

19. The mobile terminal of claim 11 wherein the mobile terminal comprises a cellular mobile terminal and the control resets a mobile attenuation code if the detector detects that the antenna is proximate a human body.

20. The mobile terminal of claim 11 wherein the control integrates transmitter power if the detector detects that the antenna is proximate a human body and limits transmitter power after the integrated transmitter power exceeds a select threshold.

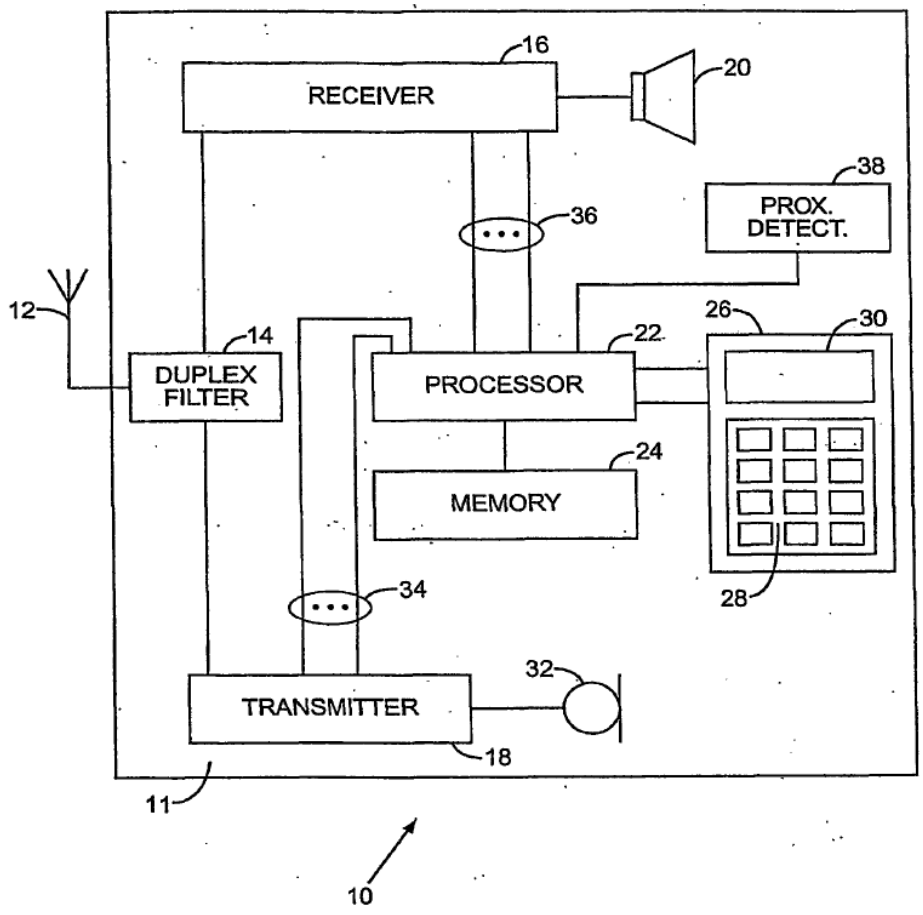


FIG. 1

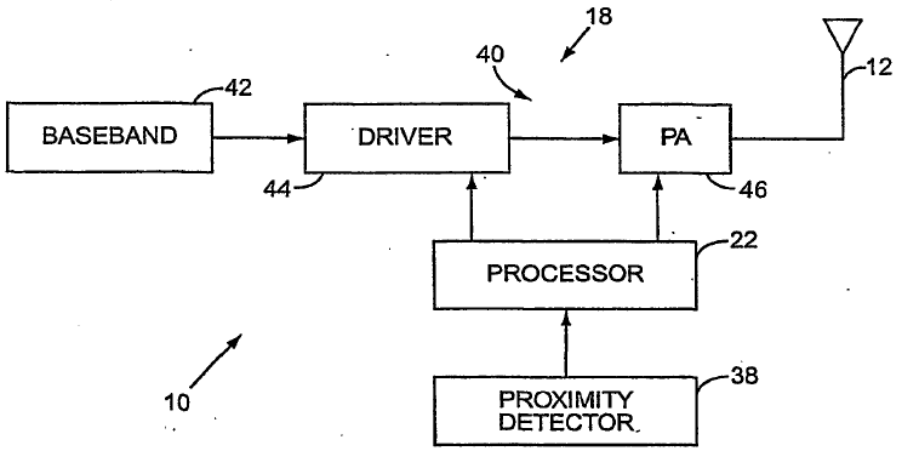


FIG. 2

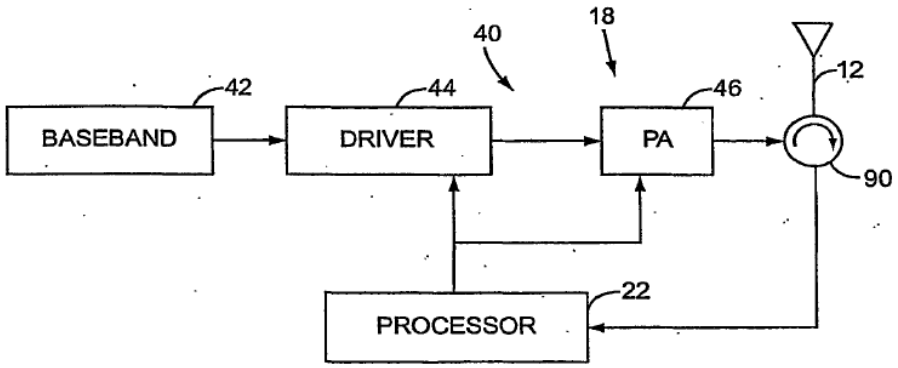


FIG. 5

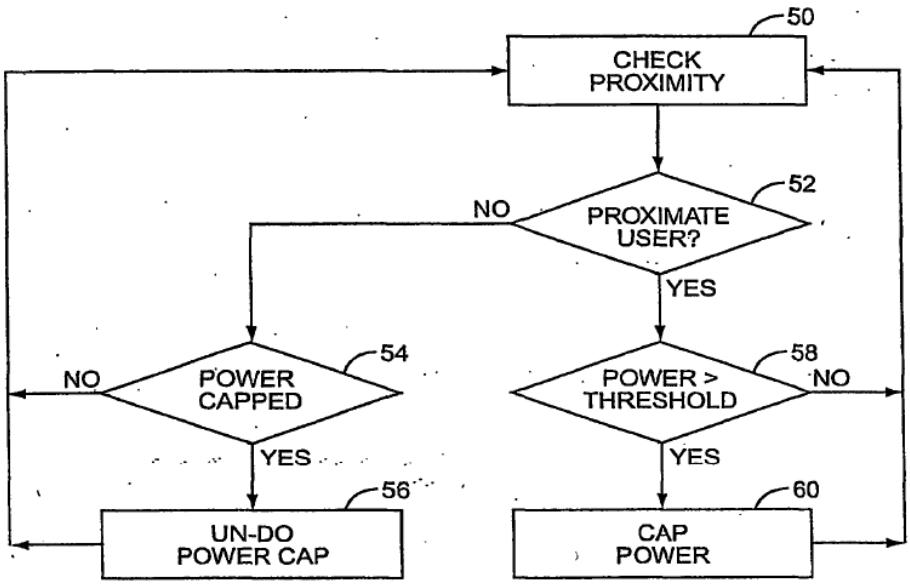


FIG. 3

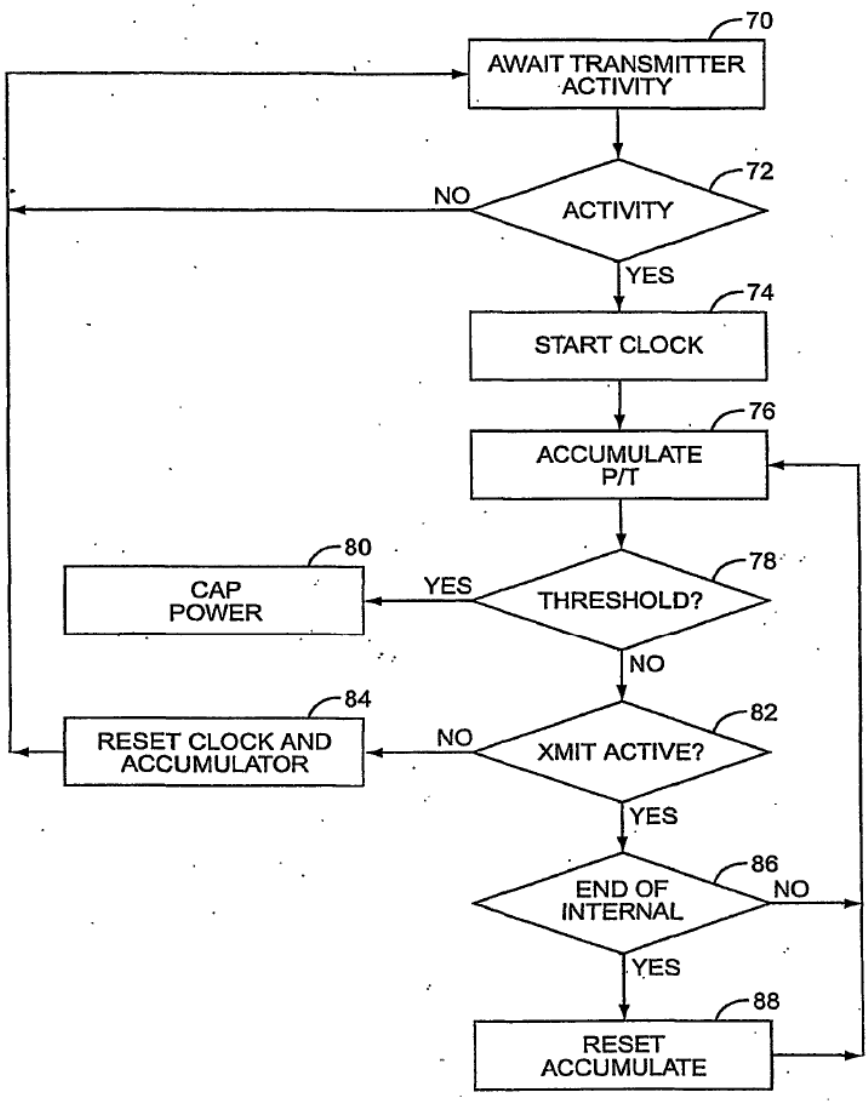


FIG. 4

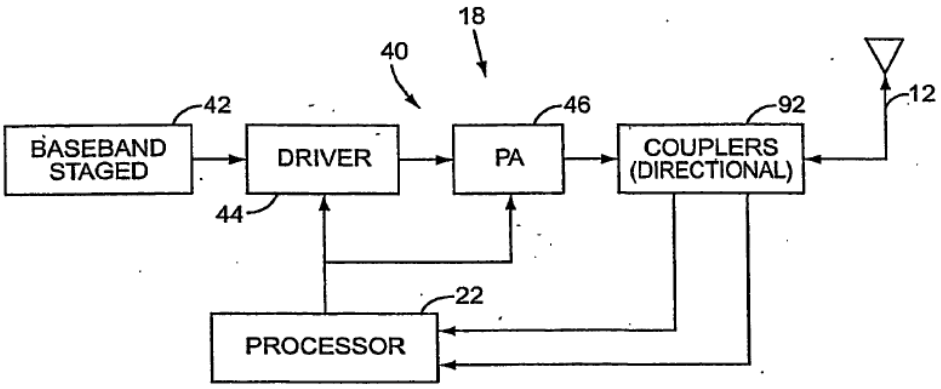


FIG. 6

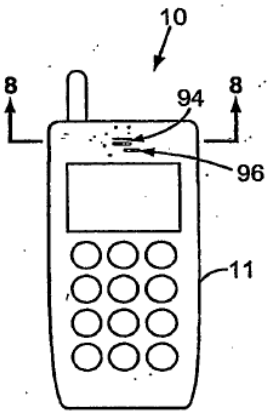


FIG. 7

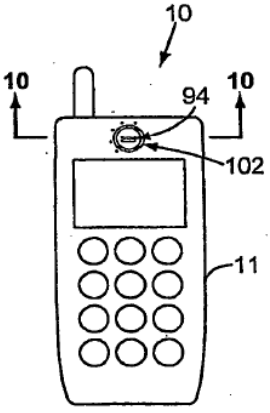


FIG. 9

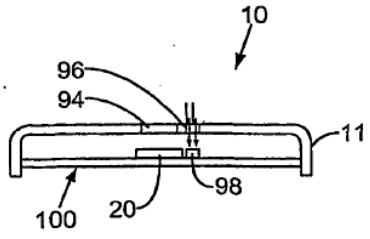


FIG. 8

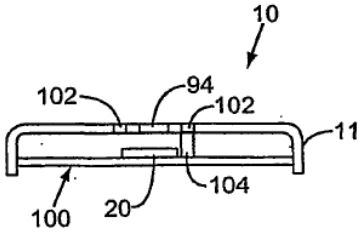


FIG. 10

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 January 2002 (17.01.2002)

PCT

(10) International Publication Number
WO 02/05443 A3

(51) International Patent Classification[7]: H04B 1/38

(21) International Application Number: PCT/US01/41059

(22) International Filing Date: 20 June 2001 (20.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/612.034 7 July 2000 (07.07.2000) US

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(72) Inventors; and

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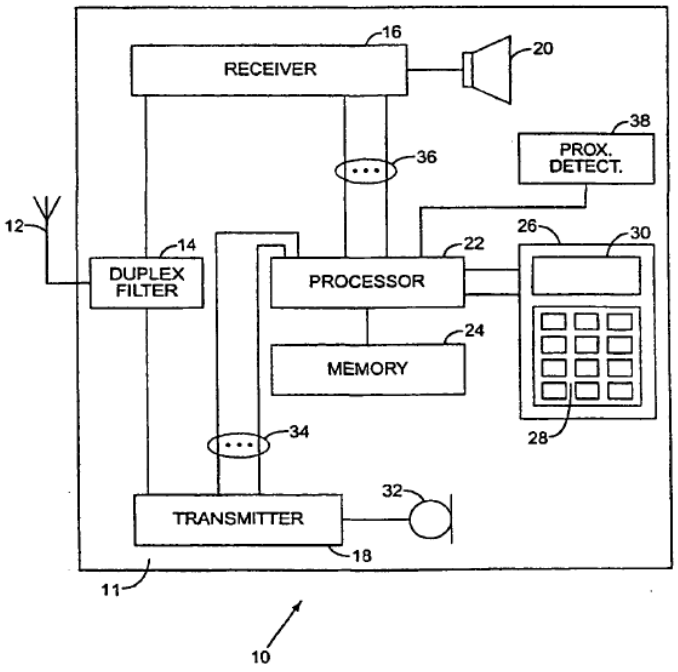
(74) Agents: BENNETT, David, E. et al.; Coats & Bennett, PLLC, Post Office Box 5, Raleigh, NC 27602 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PORTABLE COMMUNICATION DEVICE WITH RF OUTPUT POWER CAPPED WHEN THE DEVICE OPERATES IN VERY CLOSE PROXIMITY TO A HUMAN BODY



(57) Abstract: A mobile terminal (10) used in a wireless communication system is operable to limit transmitter power if proximate a human body. The mobile terminal includes a housing (11). A transmitter (18) in the housing is connected to an antenna (12). The transmitter has a power control loop controlling transmitter power. A detector (38) detects if the housing is proximate a human body. A control (22) is operatively connected to the transmitter power control loop and to the detector, the control limiting transmitter power if the detector detects that the housing is proximate a human body.

WO 02/05443 A3

Published:
— *with international search report*

(88) Date of publication of the international search report:
27 June 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/41059

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B1/38

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04B

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 949 369 A (BRADLEY JAMES FREDERICK ET AL) 7 September 1999 (1999-09-07) abstract column 4, line 52 -column 6, line 35 column 8, line 8 -column 9, line 45 column 13, line 53 -column 14, line 21 figures 6,11-13 ---	1-5, 9-15,19, 20 6-8, 16-18
A	WO 95 03549 A (QUALCOMM INC) 2 February 1995 (1995-02-02) abstract page 2, line 27 -page 6, line 8 figure 2 ---	1-20
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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

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

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 January 2002	31/01/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Tzimeas, K

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INTERNATIONAL SEARCH REPORT

Interr ·onal Application No
PCT/US 01/41059

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 752 735 A (DEUTSCHE TELEKOM MOBIL) 8 January 1997 (1997-01-08) abstract column 2, line 24 -column 3, line 23 claims 5,6,8	1-20

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INTERNAT..NAL SEARCH REPORT

..formation on patent family members

Inter ..onal Application No
PCT/US 01/41059

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		ES 2154364 T3	01-04-2001

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gp2643 41

ATTORNEY DOCKET NO. R.L. MCDOWELL 20-76 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Richard L. McDowell, *et al.*
Serial No.:	09/967,140
Filed:	September 28, 2001
Title:	A PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF
Grp./A.U.:	2643
Examiner:	Thai Vu

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

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Debbie Sams
(Signature of the person signing the certificate)

Sir:

AMENDMENT UNDER 37 C.F.R. § 1.111

The Applicants have carefully considered this application in connection with the Examiner's Action mailed August 13, 2004, and respectfully request reconsideration of this application in view of the following amendment and remarks.

IN THE CLAIMS:

1. (Currently Amended) For use with a portable cell phone, a proximity regulation system, comprising:

a location sensing subsystem configured to determine a location of said portable cell phone with respect to a portion of a body of ~~proximate~~ a user; and

a power governing subsystem, coupled to said location sensing subsystem, configured to determine a proximity transmit power level of said portable cell phone based on said location.

2. (Currently Amended) The proximity regulation system as recited in Claim 1 wherein said proximity transmit power level is reduced to one level when said location is within a vicinity of a user's head and reduced to a second level when said location is within a vicinity of a user's midsection.

3. (Original) The proximity regulation system as recited in Claim 1 wherein said proximity transmit power level is limited to a predetermined maximum level.

4. (Original) The proximity regulation system as recited in Claim 1 wherein said proximity transmit power level is maximum when said portable cell phone is operating in a headset operation mode or data transfer operation mode.

5. (Original) The proximity regulation system as recited in Claim 1 wherein said portable cell phone is located on a belt-clip of said user.

6. (Original) The proximity regulation system as recited in Claim 1 wherein said location sensing subsystem or said power governing subsystem is embodied in an integrated circuit.

7. (Original) The proximity regulation system as recited in Claim 1 wherein said location sensing subsystem or said power governing subsystem is embodied in a sequence of operating instructions.

8. (Original) The proximity regulation system as recited in Claim 1 wherein said location sensing subsystem determines said location by employing a sensor selected from the group consisting of:

a designated sensor,

a contact sensor,

a belt clip sensor, and

a cradle sensor.

9. (Original) The proximity regulation system as recited in Claim 1 wherein said location sensing subsystem determines said location by ascertaining a mode of operation of said portable cell phone.

10. (Currently Amended) A method of operating a portable cell phone, comprising:

determining a location of said portable cell phone with respect to a portion of a body of ~~proximate~~ a user;

providing a control signal based on said location; and

determining a proximity transmit power level of said portable cell phone based on said control signal.

11. (Currently Amended) The method as recited in Claim 10 wherein said proximity transmit power level is reduced to one level when said location is within a vicinity of a user's head and reduced to a second level when said location is within a vicinity of a user's midsection.

12. (Original) The method as recited in Claim 10 wherein said proximity transmit power level is limited to a predetermined maximum level.

13. (Original) The method as recited in Claim 10 wherein said proximity transmit power level is maximum when said portable cell phone is operating in a headset operation mode or data transfer operation mode.

14. (Original) The method as recited in Claim 10 wherein said portable cell phone is located on a belt-clip of said user.

15. (Original) The method as recited in Claim 10 wherein said determining said location is performed by a location sensing subsystem embodied in an integrated circuit.

16. (Original) The method as recited in Claim 10 wherein said determining a proximity transmit power level is performed by a power governing subsystem embodied in a sequence of operating instructions.

17. (Original) The method as recited in Claim 10 wherein said determining a location employs a sensor selected from the group consisting of:

a designated sensor,

a contact sensor,

a belt clip sensor, and

a cradle sensor.

18. (Original) The method as recited in Claim 10 wherein said determining a location is performed by ascertaining a mode of operation of said portable cell phone.

19. (Currently Amended) A portable cell phone, comprising:

a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower; and

a proximity regulation system, including:

a location sensing subsystem that determines a location of said portable cell phone proximate a user; and

a power governing subsystem, coupled to said location sensing subsystem, that determines a proximity transmit power level of said portable cell phone based on said location and determines a transmit power level for said portable cell phone based on said network adjusted transmit power level and said proximity transmit power level.

20. (Currently Amended) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem determines said location with respect to a portion of a body of said user ~~proximity transmit power level is reduced when said location is within a vicinity of a user's head~~.

21. (Original) The portable cell phone as recited in Claim 19 wherein said proximity transmit power level is limited to a predetermined maximum level.

22. (Original) The portable cell phone as recited in Claim 19 wherein said proximity transmit power level is maximum when said portable cell phone is operating in a headset operation mode or data transfer operation mode.

23. (Original) The portable cell phone as recited in Claim 19 wherein said portable cell phone is located on a belt-clip of said user.

24. (Original) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem or said power governing subsystem is embodied in an integrated circuit.

25. (Currently Amended) The portable cell phone as recited in Claim 19 wherein said proximity transmit power level is reduced to one level when said location is within a vicinity of a user's head and reduced to a second level when said location is within a vicinity of a user's midsection ~~location sensing subsystem or said power governing subsystem is embodied in a sequence of operating instructions~~.

26. (Original) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem determines said location by employing a sensor selected from the group consisting of:

a designated sensor,

a contact sensor,

a belt clip sensor, and

a cradle sensor.

27. (Original) The portable cell phone as recited in Claim 19 wherein said location sensing subsystem determines said location by ascertaining a mode of operation of said portable cell phone.

REMARKS/ARGUMENTS

The Applicants originally submitted Claims 1-27 in the application. The Applicants have amended Claims 1-2, 10-11, 19-20 and 25. No claims have been canceled or added. Accordingly, Claims 1-27 are currently pending in the application.

I. Rejection of Claims 1-3, 6-7, 9-12, 15-16 and 18 under 35 U.S.C. §102

The Examiner has rejected Claims 1-3, 6-7, 9-12, 15-16 and 18 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,456,856 to Werling, *et al.* The Applicants respectfully disagree.

Werling is directed to minimizing radio wave exposure to users of radio communication apparatuses. (*See* column 1, line 65 to column 2, line 12.) Werling does not teach, however, a portable cell phone that determines a location of the portable cell phone with respect to a portion of a body of a user as recited in independent Claims 1 and 10. On the contrary, Werling simply determines if a radio communication apparatus is proximate to human tissue. (*See* column 3, lines 1-8.) The Applicants do not find where Werling determines location of the radio communication apparatus with respect to a portion of a user's body. Werling, therefore, does not teach each element of independent Claims 1 and 10.

Since Werling does not disclose each and every element of independent Claims 1 and 10, Werling does not anticipate Claims 1 and 10 and Claims dependent thereon. Accordingly, the Applicants respectfully request the Examiner to withdraw the §102 rejection with respect to Claims 1-3, 6-7, 9-12, 15-16 and 18 and allow issuance thereof.

II. Rejection of Claims 4-5, 8, 13-14 and 17 under 35 U.S.C. §103

The Examiner has rejected Claims 4-5, 8, 13-14 and 17 under 35 U.S.C. §103(a) as being unpatentable over Werling in view of the following U.S. Patents: U.S. Patent No. 6, 195,562 to Pirhonen for Claims 4 and 13; U.S. Patent No. 6,408,187 to Merriam for Claims 5 and 14; and Merriam in further view of U.S. Patent No. 4,636,741 to Mitzlaff for Claims 8 and 17. The Applicants respectfully disagree.

As discussed above, Werling does not teach a portable cell phone that determines a location of the portable cell phone with respect to a portion of a body of a user as recited in independent Claims 1 and 10. Additionally, Werling does not suggest a portable cell phone that determines a location of the portable cell phone with respect to a portion of a body of a user since Werling simply addresses determining proximity of a radio communications device to human tissue. (*See* column 3, lines 1-8.)

Each of the references, Pirhonen, Merriam and Mitzlaff, have been cited to disclose the subject matter of a dependent Claim. The Applicants do not find, however, where any of the references Pirhonen, Merriam and Mitzlaff teach or suggest a portable cell phone that determines a location of the portable cell phone with respect to a portion of a body of a user. The cited references, therefore, do not teach each element of independent Claims 1 and 10 and Claims dependent thereon. Accordingly, the cited references do not provide a *prima facie* case of obviousness for Claims 4-5, 8, 13-14 and 17 which depend on Claims 1 or 10, respectively. Thus, the Applicants respectfully request the Examiner withdraw the §103(a) rejection of Claims 4-5, 8, 13-14 and 17 and allow issuance thereof.

III. Rejection of Claims 19-21, 24-25 and 27 under 35 U.S.C. §103

The Examiner has rejected Claims 19-21, 24-25 and 27 under 35 U.S.C. §103(a) as being unpatentable over Werling in view of U.S. Patent No. 6, 498,924 to Vogel, *et al.*195,562. The Applicants respectfully disagree.

As recognized by the Examiner, Werling does not teach or suggest a portable cell phone including a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower as recited in independent Claim 19. Thus, the Examiner cites Vogel to cure this deficiency of Werling. (*See* Examiner's Action, page 7.)

Vogel provides mobile radio communications systems and an apparatus for measuring the distance or the propagation time between a mobile station and a base station in such a system. (*See* column 2, lines 15-32.) Vogel provides no teaching or suggestion, however, of a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower. Instead, Vogel is directed to improving the accuracy of determining the distance and propagation. (*See* column 2, lines 1-14.) Vogel does teach in the background that the distance and propagation measurements may be used for various purposes. Vogel provides no teaching or suggestion, however, that the purpose may be for providing a power level for transmitting.

Accordingly, neither Werling nor Vogel, individually or in combination, teach or suggest a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower. Thus, neither Werling or Vogel, individually or in combination, teach or suggest a power governing subsystem that determines a transmit power level for a portable cell phone based on a network adjusted transmit power level and a proximity transmit power level as recited in Claim 19. The cited combination of Werling and Vogel, therefore, does not provide a

prima facie case of obviousness of independent Claim 19 and Claims dependent thereon. Thus, the cited combination of Werling and Vogel does not render unpatentable Claims 19-21, 24-25 and 27. Accordingly, the Applicants respectfully request the Examiner withdraw the §103(a) rejection of Claims 19-21, 24-25 and 27 and allow issuance thereof.

IV. Rejection of Claims 22, 23 and 26 under 35 U.S.C. §103

The Examiner has rejected Claims 22, 23 and 26 under 35 U.S.C. §103(a) as being unpatentable over Werling in view of Vogel and the following U.S. Patents to Pirhonen for Claim 22, to Merriam for Claim 23 and Merriam in further view of Mitzlaff for Claim 26. The Applicants respectfully disagree.

As discussed above, the combination of Werling and Vogel does not teach or suggest each element of independent Claim 19. Each of the references, Pirhonen, Merriam and Mitzlaff, have not been cited to cure the above deficiency of Werling and Vogel but to disclose the subject matter of a dependent claim. The Applicants do not find, however, where any of the references Pirhonen, Merriam and Mitzlaff teach or suggest a portable cell phone including a power circuit that provides a network adjusted transmit power level as a function of a position to a communications tower and a proximity regulation system including a power governing subsystem that determines a transmit power level for the portable cell phone based on the network adjusted transmit power level and a proximity transmit power level. The cited references, therefore, do not teach each element of independent Claim 19 and Claims dependent thereon. Accordingly, the cited references do not provide a *prima facie* case of obviousness for Claims 22, 23 and 26 which depend on Claim 19.

Thus, the Applicants respectfully request the Examiner withdraw the §103(a) rejection of Claims 22, 23 and 26 and allow issuance thereof.

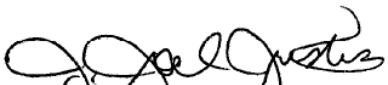
V. Conclusion

In view of the foregoing amendment and remarks, the Applicants now see all of the Claims currently pending in this application to be in condition for allowance and therefore earnestly solicit a Notice of Allowance for Claims 1-27.

The Applicants request the Examiner to telephone the undersigned attorney of record at (972) 480-8800 if such would further or expedite the prosecution of the present application.

Respectfully submitted,

HITT GAINES, P.C.



J. Joel Justiss
Registration No. 48,981

Dated: 11/15/09

P.O. Box 832570
Richardson, Texas 75083
(972) 480-8800

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2000

Application or Docket Number: R.L. MCDOWELL-2078

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	27	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	27 minus 20=	* 7
INDEPENDENT CLAIMS	3 minus 3 =	* 0
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	355.00	OR	BASIC FEE	710.00
X$ 9=		OR	X$18=	126
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL		OR	TOTAL	836

11/18/04 **CLAIMS AS AMENDED - PART II**

AMENDMENT A	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 27	Minus	** 27	= 0
Independent	* 3	Minus	*** 3	= 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,140	09/28/2001	Richard L. McDowell	R.L. MCDOWELL 20-76	4925

27964 7590 08/13/2004

HITT GAINES P.C.
P.O. BOX 832570
RICHARDSON, TX 75083

EXAMINER	
VU, THAI	
ART UNIT	**PAPER NUMBER**
2643	5

DATE MAILED: 08/13/2004

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

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	09/967,140	MCDOWELL ET AL.	
	Examiner	Art Unit	
	Thai Vu	2643 .	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 September 2001*.

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

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

Disposition of Claims

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

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

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

Application Papers

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

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

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

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

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

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

a)☐ All b)☐ Some * c)☐ None of:

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

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

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

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

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

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

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3, 6-7, 9-12, 15-16 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Werling et al. (U.S. Patent #: 6,456,856; hereinafter "Werling").

Regarding claim 1, Werling teaches a system for use with a portable cell phone, a proximity regulation system (FIG. 1), comprising:

a location sensing subsystem configured to determine a location of said portable cell phone proximate a user (i.e. the proximity detector noted in FIG. 1, block 18; column 3, lines 1-14) ; and

a power governing subsystem, coupled to said location sensing subsystem, configured to determine a proximity transmit power level of said portable cell phone based on said location (FIG. 1, block 17; column 3, lines 15-18).

Regarding claim 2, Werling teaches limitations of the claim in column 3, lines 1-14 (i.e. power is reduced when phones used close to human body including head).

Regarding claim 3, Werling teaches limitations of the claim in column 4, lines 36-60 (i.e. P_{MAX}).

Regarding claim 6, Werling further teaches limitations of the claim in FIG.1, block 17 and column 2, lines 54-66 (i.e. Micro controllers which are widely available as integrated circuits).

Regarding claim 7, Werling further teaches limitations of the claim in FIG. 4 and column 4, lines 40-60.

Regarding claim 9, Werling further teaches limitations of the claim in column 3, lines 1-14.

Regarding claim 10, Werling teaches a method of operating a portable cell phone, comprising:

determining a location of said portable cell phone proximate a user (i.e. based on temperature and humidity, the proximity can be determined, column 3, lines 1-14);

providing a control signal based on said location (i.e. control signal provided by a microcontroller in FIG. 1, column 3 lines 15-18) ; and

determining a proximity transmit power level of said portable cell phone based on said control signal (FIG. 1 block 16, column 3, lines 15-18).

Regarding claim 11, Werling teaches limitations of the claim in column 3, lines 1-14 (i.e. power is reduced when phones used close to human body including head).

Regarding claim 12, Werling teaches limitations of the claim in column 4, lines 36-60 (i.e. P_{MAX}).

Regarding claim 15, Werling further teaches limitations of the claim in FIG.1, block 17 and column 2, lines 54-66 (i.e. Micro controllers which are widely available as integrated circuits).

Regarding claim 16, Werling further teaches limitations of the claim in FIG. 4 and column 4, lines 40-60.

Regarding claim 18, Werling further teaches limitations of the claim in column 3, lines 1-14.

Claim Rejections - 35 USC § 103

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

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

4. Claims 4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werling (U.S. Patent #: 6,456,856) in view of Pirhonen et al. (US Patent #: 6,195,562; hereinafter "Pirhonen").

Regarding claims 4 and 13, Werling teaches all subject matter as claimed above except for proximity transmit power level being maximum when said portable cell phone is operating in a headset operation mode or data transfer operation mode. However, Pirhonen teaches such limitations in column 2, lines 29-37 for the purpose of achieving high speed data transmission.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of proximity transmit power level being maximum when said portable cell phone is operating in a data transfer operation mode, as taught by Pirhonen, in view of Werling, in order to achieve high speed data transmission.

5. Claims 5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werling (U.S. Patent #: 6,456,856) in view of Merriam (U.S. Patent #: 6,408,187; hereinafter "Merriam").

Regarding claims 5 and 14, Werling teaches all subject matter as claimed above except for portable cell phone being located on a belt-clip of the user. However, Merriam teaches such limitations in column 3, lines 36-49 for the purpose of indicating whether the device within relatively close proximity to a user.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the inventions was made to incorporate the use of portable cell phone being located on a belt-clip of the user, as taught by Merriam, in view of Werling, in order to determine the behavior of the communications device.

6. Claims 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werling et al. (U.S. Patent #: 6,456,856) in view of Merriam (U.S. Patent #: 6,408,187) and Mitzlaff (U.S. Patent #: 4,636,741; hereinafter "Mitzlaff").

Regarding claims 8 and 17, Werling teaches all subject matter as claimed above. Werlington further teaches location sensing subsystem determining said location by employing a sensor selected from the group consisting of:

a designated sensor (column 3, lines 1-14),

a contact sensor (i.e. heat/humidity sensor is used to detect a contact with human skin, column 3, lines 1-14)

It should be noticed that Werlington fails to clearly teach a belt clip sensor. However, Merriam teaches such limitations in column 3, lines 36-49 for the purpose of indicating whether the device within relatively close proximity to a user.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of a belt clip sensor, as taught by Merriam, in view of Werlington, in order to determine the behavior of the mobile unit.

It should be further noticed that Werlington and Merriam, in combination, fails to clearly teach a cradle sensor. However, Mitzlaff teaches such limitations in the abstract for the purpose of detecting the presence of the Mobile unit.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of a cradle sensor, as taught by Mitzlaff, into view of Werlington and Merriam, in order to adjust the transmission power accordingly.

7. Claim 19-21, 24-25 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Werling (U.S. Patent #: 6,456,856) in view of Vogel et al. (U.S. Patent #: 6,498,924, hereinafter "Vogel").

Regarding claim 19, Werling teaches a portable cell phone (FIG.2), comprising:

a power circuit (FIG. 1 block 16 column 2 lines 54-66)

a proximity regulation system, including:

a location sensing subsystem that determines a location of said portable cell phone proximate a user (FIG. 1, block 18; column 3, lines 1-14); and

a power governing subsystem, coupled to said location sensing subsystem, that determines a proximity transmit power level of said portable cell phone based on said location (FIG. 1, block 17; column 3, lines 15-18).

It should be noticed that Werling fails to clearly teach the feature of providing a network adjusted transmit power level as a function of a position to a communications tower. However, Vogel teaches such limitations in column 1, lines 26-37 for the purpose of reducing the overall interference level.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of providing a network adjusted transmit power level as a function of a position to a communications tower, as taught by Vogel, in view of Werling, in order to prevent the cell phone from unnecessarily transmitting at highest level at all times.

Regarding claim 20, Werling teaches limitations of the claim in column 3, lines 1-14 (i.e. power is reduced when phones used close to human body including head).

Regarding claim 21, Werling teaches limitations of the claim in column 4, lines 36-60 (i.e. P_{MAX}).

Regarding claim 24, Werling further teaches limitations of the claim in FIG.1, block 17 and column 2, lines 54-66 (i.e. Micro controllers which are widely available as integrated circuits).

Regarding claim 25, Werling further teaches limitations of the claim in FIG. 4 and column 4, lines 40-60.

Regarding claim 27, Werling further teaches limitations of the claim in column 3, lines 1-14.

8. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Werling (U.S. Patent #: 6,456,856) in view of Vogel (U.S. Patent #:6,498,924) as applied to claim 19 above, and in further view of Pirhonen et al. (US Patent #: 6,195,562).

Regarding claim 22, Werlington and Vogel, in combination, teaches all subject matter as claimed above except for proximity transmit power level being maximum when said portable cell phone is operating in a headset operation mode or data transfer operation mode. However, Pirhonen teaches such limitations in column 2, lines 29-37 for the purpose of achieving high speed data transmission.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of proximity transmit power level being maximum when said portable cell phone is operating in a data transfer operation mode, as taught by Pirhonen, into view of Werling and Vogel, in order to achieve high speed data transmission.

9. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Werling (U.S. Patent #: 6,456,856) in view of Vogel (U.S. Patent #:6,498,924) as applied to claim 19 above, and in further view of Merriam (U.S. Patent #: 6,408,187).

Regarding claim 23, Werling and Vogel, in combination, teaches all subject matter as claimed above except for portable cell phone being located on a belt-clip of the user. However, Merriam teaches such limitations in column 3, lines 36-49 for the purpose of indicating whether the device within relatively close proximity to a user.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the inventions was made to incorporate the use of portable cell phone

being located on a belt-clip of the user, as taught by Merriam, into view of Werling and Vogel, in order to determine the behavior of the communications device.

10. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Werling et al. (U.S. Patent #: 6,456,856) in view of Vogel (U.S. Patent #:6,498,924) as applied to claim 19 above, and in further view of Merriam (U.S. Patent #: 6,408,187) and Mitzlaff (U.S. Patent #: 4,636,741).

Regarding claim 26, Werlington and Vogel, in combination, teaches all subject matter as claimed above. Werlington further teaches location sensing subsystem determining said location by employing a sensor selected from the group consisting of:

a designated sensor (column 3, lines 1-14),

a contact sensor (i.e. heat/humidity sensor is used to detect a contact with human skin, column 3, lines 1-14)

It should be noticed that Werlington and Vogel, in combination, fails to clearly teach a belt clip sensor. However, Merriam teaches such limitations in column 3, lines 36-49 for the purpose of indicating whether the device within relatively close proximity to a user.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of a belt clip sensor, as taught by Merriam, in view of Werlington and Vogel, in order to determine the behavior of the mobile unit.

It should be further noticed that Werlington, Vogel and Merriam, in combination, fails to clearly teach a cradle sensor. However, Mitzlaff teaches such limitations in the abstract for the purpose of detecting the presence of the Mobile unit.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the use of a cradle sensor, as taught by Mitzlaff, into view of Werlington, Vogel and Merriam, in order to adjust the transmission power accordingly.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thai Vu whose telephone number is 703-305-3417. The examiner can normally be reached on 9:00AM-6:00PM, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Kuntz can be reached on 703-305-3900. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thai Vu
Examiner
Art Unit 2643

BINH TIEU
PRIMARY EXAMINER

Notice of References Cited	Application/Control No. 09/967,140	Applicant(s)/Patent Under Reexamination MCDOWELL ET AL.	
	Examiner Thai Vu	Art Unit 2643	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-6,498,924 B2	12-2002	Vogel et al.	455/67.11
	B	US-6,456,856 B1	09-2002	Werling et al.	455/575.5
	C	US-6,195,562 B1	02-2001	Pirhonen et al.	455/553.1
	D	US-6,408,187 B1	06-2002	Merriam, Charles	455/458
	E	US-4,636,741	01-1987	Mitzlaff, James E.	330/127
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

PTO/SB/08A (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	09/967,140
Filing Date	09/28/2001
First Named Inventor	Richard L. McDowell
Art Unit	2681
Examiner Name	N/A
Attorney Docket Number	R.L. MCDOWELL 20-76

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] - Number[4] - Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
✓		EP 0 977 304 A1	02/02/2000	Werling, et al.		
✓		EP 0 843 421 A2	05/20/1998	Pirhonen, Riku		
✓		WO 98/29968	07/09/1998	Bradley, James F., et al.		

Examiner Signature		Date Considered	08/05/04

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

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

US006195562B1

(12) **United States Patent**
Pirhonen et al.

(10) **Patent No.: US 6,195,562 B1**
(45) **Date of Patent: *Feb. 27, 2001**

(54) **SYSTEM FOR LIMITING THE TRANSMITTED POWER OF A MOBILE COMMUNICATION MEANS**

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(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/968,645**

(22) Filed: **Nov. 12, 1997**

(30) **Foreign Application Priority Data**

Nov. 13, 1996 (FI) 964548

(51) **Int. Cl.**[7] **H04B 1/38**; H04M 1/00
(52) **U.S. Cl.** **455/553**; 455/522; 455/557
(58) **Field of Search** 455/522, 550, 455/552, 553, 557, 575, 90, 559, 127, 125, 574

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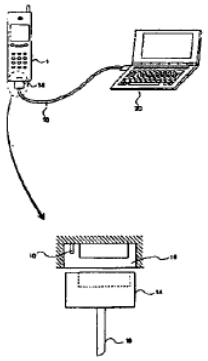
(74) *Attorney, Agent, or Firm*—Perman & Green, LLP

(57) **ABSTRACT**

The aim of the invention is to restrict the maximum transmitted power used by a mobile communication device. In most countries there are regulations in force which impose certain maximum limits on the power of electromagnetic radiation directed towards humans. These limits vary from country to country and will most probably be tightened in the future. In the system according to the invention, the upper limit of transmitted power is varied according to the mode of usage of the mobile communication device. A mobile communication device according to such a system meets the requirements made on a device operating close to the user's head, but the same mobile communication means may still be used in applications demanding greater transmitted power in a situation where the power limits placed on the radio set are less strict.

5 Claims, 3 Drawing Sheets



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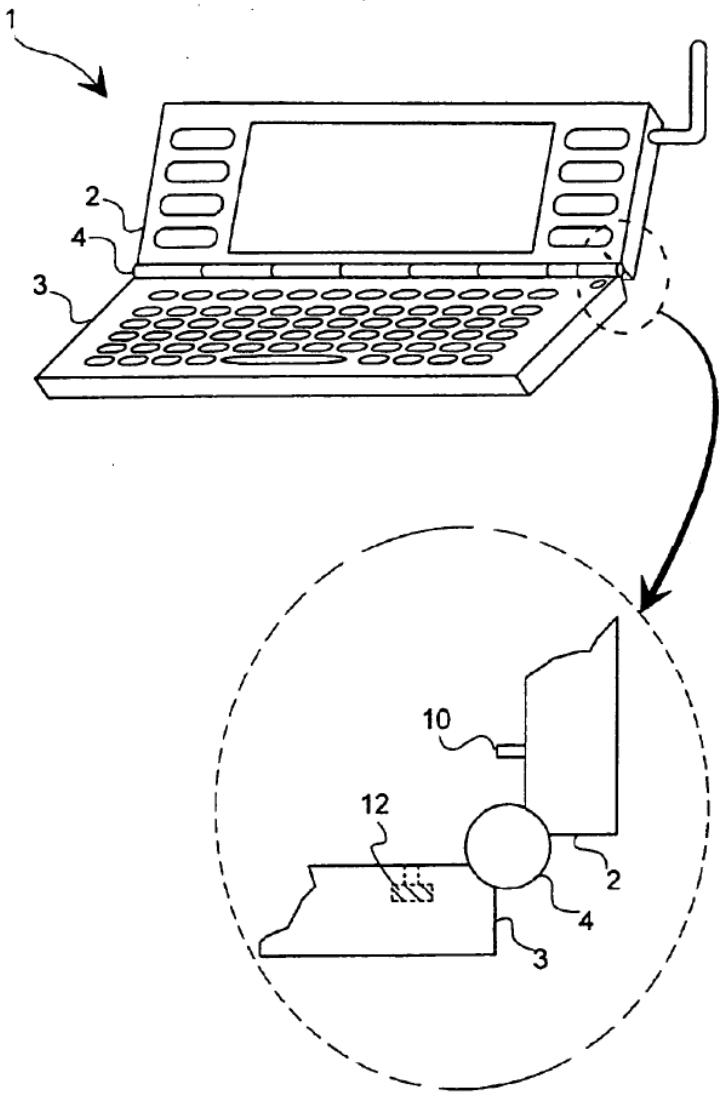

Fig. 1

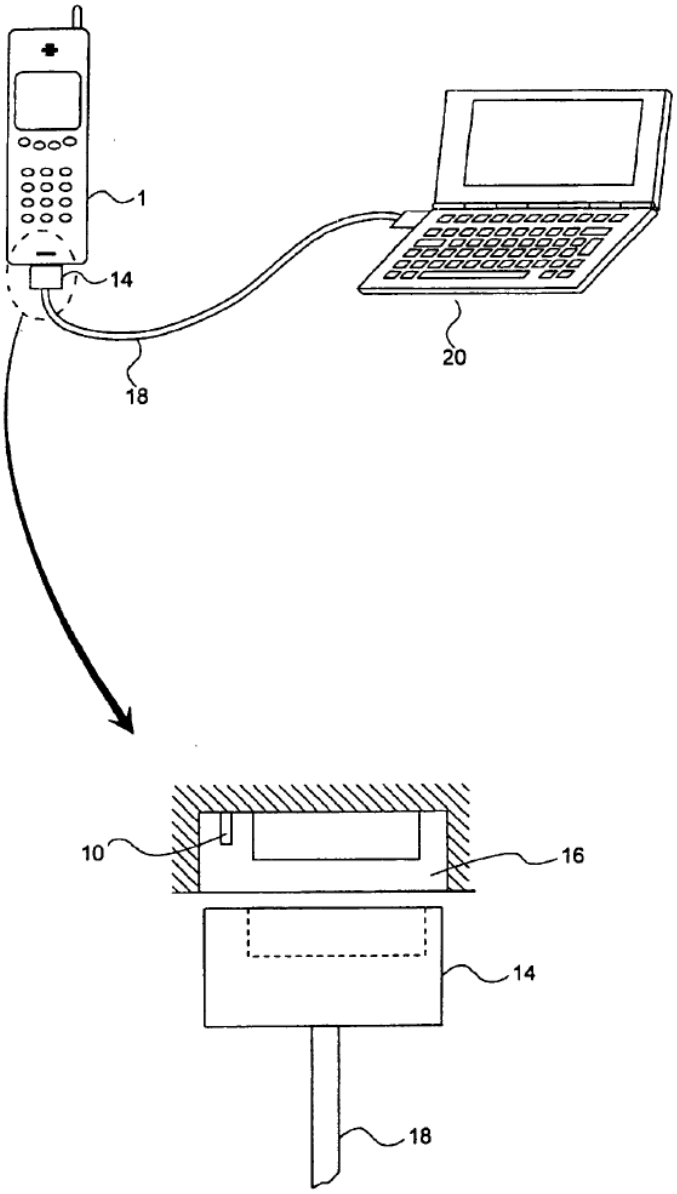

Fig. 2

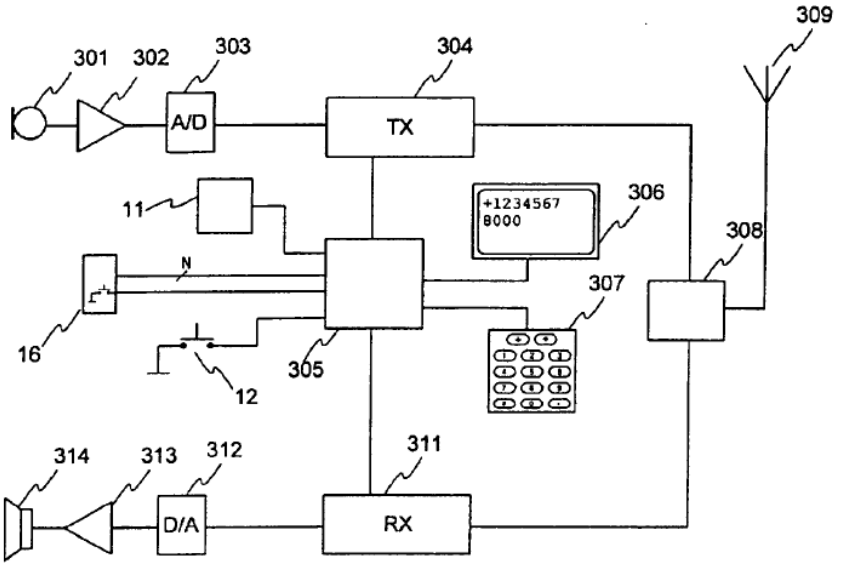

Fig. 3

SYSTEM FOR LIMITING THE TRANSMITTED POWER OF A MOBILE COMMUNICATION MEANS

FIELD OF THE INVENTION

This invention is aimed at limiting the maximum transmitted power used by a mobile communication means.

BACKGROUND OF THE INVENTION

In most countries there are regulations in force which place certain maximum limits on the power of electromagnetic radiation directed towards humans. These limits vary from country to country and will most probably be tightened in the future.

On the other hand, as the transmission speed in mobile communication means systems increases, the amount of energy radiated by mobile communication means also increases. For example, in networks based upon TDMA technology, data transmission speeds may in principle be increased by using several successive time slots in the same TDMA frame, in which case the mean transmitted power increases. The use of several successive time slots in the same frame is possible in the Universal Mobile Telecommunication System (UMTS) under development and in new Global System for Mobile communications (GSM) standards which are under development. In CMDA systems the transmitted power has to be raised in line with the data transmission speed if one wishes to keep the bit error rate constant. In both basic techniques the amount of energy radiated by the antenna increases as the data transmission speed increases, in which case the permitted limits may at some stage be exceeded.

The radiation power caused by a particular radio set and directed towards the user is typically measured on the basis of the least favourable operating situation, in the case of a cordless telephone with the antenna almost pressed against the user's head. If a radio set may be used in many ways demanding differing transmitted power, for example for voice transmission and for high-speed data transfer, all functions of the radio set have to adjust to the limits which follow from the least favourable operating situation.

For example in the current GSM system, the maximum power of a mobile communication means which is used during one time slot is 2 W, which means that the mean transmitted power is approximately 250 mW. According to new GSM standards which are being developed, a mobile communication means may use for the high-speed data transfer as many as all eight time slots in one frame, in which case the mean transmitted power is 2 W. This causes problems if the 250 mW which is satisfactory for voice calls has been set as the upper limit of radio power directed towards the user's head. In this situation the mobile communication means may not use maximum power levels, but must use instantaneous transmitted power lower than in a voice call, so that the limit of mean transmitted power is not exceeded. This again causes audibility problems, since the base stations in the mobile communication means network are designed to cope with the needs of a voice link.

SUMMARY OF THE INVENTION

The aim of this invention is to create a system which adjusts the power level used by a mobile communication means to the mode of usage of the mobile communication means. A further aim of the invention is to create a system with the aid of which a mobile communication means may utilize the maximum permitted transmitted power in any given situation. In addition, an aim of the invention is to create a system with the aid of which the user may, if he so desires, limit the maximum values of electromagnetic radiation directed towards his body.

These aims are achieved by incorporating in the mobile communication means a device for identification of the mode of usage, and by arranging for the transmitted power of the mobile communication means to be limited according to the mode of usage and the type of current connection or connections.

Characteristic of the system according to the invention is what is described in the characteristic part of the independent claims. Dependent claims describe further advantageous embodiments of the invention. The invention is further directed to a mobile communication means, which is characterized by that which is described in the characterizing part of the corresponding independent claim.

In the system according to the invention, the upper limit of transmitted power used by the mobile communication means is varied according to the mode of usage. A mobile communication means according to such a system meets the more stringent requirements placed upon sets which are to be used next to the user's head, but the same mobile communication means may still be employed for applications demanding greater transmitted power in a situation where the power limits imposed on the radio set are less strict.

When a mobile communication means is used in a situation typical of a telephone, the mean power transmitted by the mobile communication means is limited to the maximum value for a telephone permitted by regulations and test procedures. When a mobile communication means is used for example as a data transfer device in conjunction with a portable computer, the maximum permissible transmitted power may be increased in accordance with the requirements of the data transfer rate employed.

SHORT DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail with reference to favourable embodiments, presented by way of example, and to the attached drawings, where

FIG. 1 represents one possible mechanism for identification of the mode of usage of a mobile communication means, as used in the system according to the invention,

FIG. 2 represents a second possible mechanism for identification of the mode of usage of a mobile communication means, as used in the system according to the invention, and

FIG. 3 illustrates an advantageous embodiment of the invention.

In the drawings, the same reference numbers and symbols are used for parts which correspond to each other.

DETAILED DESCRIPTION OF THE PREFERRED INVENTION

In the system according to the invention, the transmitted power of a mobile communication means is limited according to its operating situation. When the mobile communication means is used as a cordless telephone next to the user's head, the system restricts the transmitted power of the mobile communication means to the limits demanded by this situation. When the user connects the mobile communication means to a portable microcomputer, for the purpose of data transfer for example, the system permits the use of transmitted power greater than in the preceding situation, in

which case the mobile communication means may use transmission speeds higher than the transmission speed required for a talking connection. Without impairment of the quality of the link. A mobile communication means equipped with such a system is capable of adhering to differing transmitted power limits according to different operating situations, with the possibility however of using the high transmitted power required by high transmission speeds when it is both necessary and possible.

In the system according to this invention, several different methods may be employed for identification of the mode of usage of the mobile communication means, depending upon the design of the mobile communication means to which the invention is applied.

Some mobile communication means are openable, so that, when the mobile communication means is closed, the communication means acts as a cordless telephone, and when it is open the communication means acts, for example, as a portable computer and multi-purpose communication means, which may be used for data transfer in many ways employing known technology. An example of this which may be mentioned is the GSM multi-purpose communication means, as presented, for example, on pages 57–58 of issue 31, 1996, of Mobile Communications International. FIG. **1** contains a particular solution according to the invention as applied to such a mobile communication means. On different sides of a hinge **4** for connection of two openable parts **2**, **3** of a mobile communication means are situated a switch **12** in a recess and a pin **10**. When the mobile communication means is closed for normal telephone operation, the pin **10** presses against the switch **12**. When the user opens the mobile communication means, the pin **10** releases the switch **12**, so that the system according to the invention receives information concerning a change of mode of usage of the mobile communication means.

The structure in FIG. 1 is merely an example of a possible solution. Monitoring of the cover position may, in the system according to the invention, be realized in many other ways familiar to men skilled in the art.

Mobile communication means are frequently used connected to a portable computer. FIG. **2** shows one particular method of detection of the mode in such a configuration. In FIG. **2**, a portable computer **20** is connected by means of a connection cable **18** to a mobile communication means **1**. At the interface **16** of the mobile communication means **1** there is a pin **10**, which is pressed down by the plug **14** of the connection cable **18** when the user inserts the plug **14** into the mobile communication means. The pin **10** may for example press against a mechanical switch so that the system is notified of the change of mode. Connected to a portable computer, the mobile communication means is usually employed purely for data transfer, in which case the computer acts as a terminal, for example, with which the user links up to the computing system at his place of work. In such a situation high transmission speeds are also an advantage. In such an application a system according to the invention permits the use of high transmitted power necessitated by the data transfer rates when the plug **14** is inserted into the connection socket **16**. When the connection cable **18** is not connected to the mobile communication means **1**, the system according to the invention only permits the use of transmitted power as required for a voice call.

Identification of the mode of usage may also be based upon the use of a position switch or any other conventional position sensing device, in which case the system permits the use of high transmitted power when the mobile communication means is in the horizontal plane or sufficiently close to a horizontal position, for example when it is placed on a table. The position switch is to best advantage designed to recognize in particular when that side of the mobile communication means which is greatest in surface area is horizontal. With such an arrangement it is possible to avoid incorrect mode identification, for example in a situation where the user is speaking into the mobile communication means at the same time as leaning backwards in an armchair.

In the mobile communication means there may be a special pull-out alphanumeric keyboard for the entry of text. In such a mobile communication means identification of the mode may be based upon the position of the keyboard: the system interprets the set as being in telephone use when the keyboard is retracted within the set, and in data transfer use when the keyboard is pulled out.

In a system according to this invention, restriction of the mean transmitted power being used may be effected in a number of different ways. In time division mobile communication means systems, the mean transmitted power may be reduced by decreasing the number of time slots transmitted in one frame, in which case the data transmission speed drops. The mean transmitted power may also be reduced by decreasing the instantaneous power used during one time slot, in which case the number of time slots to be transmitted may be kept constant.

Limitation of the transmitted power may to best advantage be effected according to the operating situation. For example, if the mobile communication means is transmitting a file from its memory at a high data transfer rate using several time slots precisely when the user switches the telephone to a mode in which the set is used principally as a telephone, the method for limitation of transmitted power which is employed may be chosen on the basis of the type of data transmission connection. If the transmission connection used permits a change in the transmission speed, the system reduces the number of time slots used. If the transmission connection does not permit a change in the transmission speed, the number of time slots used must be kept constant, in which case the transmitted power used during one time slot must be reduced. In conditions of good audibility this is not a problem, but reduction of transmitted power at the margins of the area covered by the base station may cause an increase in bit error probability or interruption of the connection.

Power transmitted in CDMA systems may be reduced either by lowering the data transmission speed, in which case the quantity of energy transmitted by the mobile communication means falls, or by keeping the data transmission speed the same but reducing the transmitted power, for example by decreasing the transmitter's output stage amplification, in which case the bit error rate of the connection increases. The choice of the best procedure thus depends upon the quality of the connection in the CDMA system, upon the data transmission speed and upon the quality of the transmission connection.

Owing to the various effects of the different ways of limiting transmitted power as described above, the user may to his advantage determine in advance the type of power limiting method which the mobile communication means should use in the first place. The user may, for example, decide that the mobile communication means should in the first place reduce the number of time slots used, in which case the connection will be maintained more securely, and that the power used during one time slot should be reduced only when some other type of function is not possible.

In the system according to this invention, the maximum power limit observed by the system when the mobile communication means is used as a telephone may be set on manufacture of the mobile communication means on the basis of test measurements carried out on samples. Owing to changes in the limits set by the authorities and to the differing regulations in different countries, it is an advantage if the said power limit can be changed at a later stage either by the retailer or by the user of the mobile communication means.

The system according to the invention may furthermore restrict the modes of usage of the mobile communication means when the mobile communication means uses a high transmitted power. The system may, for example, totally prevent use of the mobile communication means as a telephone, or permit only calls made with the aid of the hands-free function. With such an arrangement it is possible to affect the user in such a way that he does not use the mobile communication means in a situation in which the mobile communication means exceeds the limits according to issued regulations.

The system according to the invention may thus restrict the function of the mobile communication means in addition to limiting of the transmitted power, by restricting the mode of usage. The system may then react to a change in mode when a high data transmission speed and a high transmitted power are in use, for example in the following three ways:

by reducing the number of time slots used during one frame,

if this is not possible on account of the transmission mode used, by reducing the power used during one time slot, or

by preventing the making of a normal call, if a decrease in the transmitted power used in data transfer threatens to interrupt the transmission connection.

FIG. **3** shows a block diagram of a digital mobile communication means according to an advantageous embodiment of the invention. The mobile communication means comprises a microphone **301**, keyboard **307**, display **306**, earpiece **314**, antenna duplexer or switch **308**, antenna **309** and a control unit **305**, which all are typical components of conventional mobile communication means. Further, the mobile communication means contains typical transmission and receiver blocks **311**, **304**. Transmission block **311** comprises functionality necessary for speech and channel coding, encryption, and modulation, and the necessary RF circuitry for amplification of the signal for transmission. Receiver block **304** comprises the necessary amplifier circuits and functionality necessary for demodulating and decryption of the signal, and removing channel and speech coding. The signal produced by the microphone **301** is amplified in the amplifier stage **302** and converted to digital form in the A/D converter **303**, whereafter the the signal is taken to the transmitter block **304**. The transmitter block encodes the digital signal and produces the modulated and amplified RF-signal, whereafter the RF signal is taken to the antenna **309** via the duplexer or switch **308**. The receiver block **311** demodulates the received signal and removes the encryption and channel coding. The resulting speech signal is converted to analog form in the D/A converter **312**, the output signal of which is amplified in the amplifier stage **313**, whereafter the amplified signal is taken to the earpiece **314**. The control unit **305** controls the functions of the mobile communication means, reads the commands given by the user via the keypad **306** and displays messages to the user via the display **307**. Further, the control unit communicates with external devices via the connection socket **16** and monitors the state of the switch inside the communication socket **16** as well as other switches **12** indicating the mode of usage of the communication means. The control unit may also monitor the output signal of a position sensing device **11**. The control unit then controls the transmitting power of the communication means and/or allows and/or restricts the mode of usage of the communication means in the ways described previously. When performing such control, the control unit may take also into account the types of the connections active at that time. For example, if one of the connections is for communication of speech and the mobile communication means is not in a hands-free mode, the control unit may limit the transmitting power. As a further example, if the mobile communication means is in a hands-free mode, the control unit may allow any necessary transmission mode and power to be used, since the user will most likely not have the mobile communication means close to his/her body in such a situation.

The present invention is not limited to the embodiment of FIG. **3**, which is presented as an example only. For example, the invention can as well be applied to an analog communication means.

With the aid of the system according to the invention the mobile communication means user may limit the amount of radiation directed towards his body.

A mobile communication means utilizing the system according to the invention may be employed both as a cordless telephone and as a high-speed data transfer device and in both operating situations it may use the maximum mean transmitted power permitted in the operating situation in question.

The invention has been explained above with reference to certain favourable applications thereof, but it is clear that the invention may be varied in many different ways within the framework of the innovative concept defined in the attached Patent Claims.

What is claimed is:

1. A system for limiting the transmitted power of a mobile communication means having at least one connection having a connection type comprising

at least one means for producing an indication of the mode of usage of the mobile communication means, one mode of usage being for voice transmission and another mode of usage being for data transmission; and

a control unit for controlling the functions of the mobile communication means and for controlling the magnitude of the transmitting power of the mobile communication means as a response to said means for producing an indication of the mode of usage thereof and the connection type of the at least one connection;

wherein the control unit is operable for limiting the number of time slots used for transmission in one frame of a time division mobile communication means system as a response to an indication produced by said means for identification and the connection type of the at least one connection, transmitted power being a function of the number of time slots transmitted in one frame of the time division mobile communication means system.

2. A system according to claim **1** comprising

a connector for connecting an external cable,

and in which system at least one of said at least one means for producing an indication is a switch indicating whether or not there is a cable connected to said connector.

3. A system in according to claim 1 comprising

a first part, a second part, and at least one hinge for rotatably attaching said first part to said second part,

and in which system at least one of said at least one means for producing an indication is a means for producing an indication of the relative position of said first and second parts of the mobile communication means.

4. A system in according to claim 1 wherein

at least one of said at least one means for producing an indication is a position sensing device.

5. A mobile communication means having at least one connection having a connection type comprising

at least one means for producing an indication of the mode of usage of the mobile communication means, one mode of usage being for voice transmission and another mode of usage being for data transmission,

a control unit for controlling the functions of the mobile communication means and for controlling the transmitting power of the mobile communication means as a response to an indication produced by said means for identification and the connection type of the at least one connection;

wherein the control unit is operable for limiting the number of time slots used for transmission in one frame of a time division mobile communication means system as a response to an indication produced by said means for identification and the connection type of the at least one connection, transmitted power being a function of the number of time slots transmitted in one frame of the time division mobile communication means system.

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US006456856B1

(12) **United States Patent**
Werling et al.

(10) **Patent No.: US 6,456,856 B1**
(45) **Date of Patent: Sep. 24, 2002**

(54) **MOBILE RADIO EQUIPMENT FORMING ANTENNA PATTERN TO PROJECT USER FROM RADIATION**

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(73) Assignee: **Koninklijke Philips Electronics N.V.** (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/361,074**

(22) Filed: **Jul. 26, 1999**

(30) **Foreign Application Priority Data**

Jul. 28, 1998 (FR) 98 09651

(51) **Int. Cl.**[7] **H04B 1/38**
(52) **U.S. Cl.** **455/550**; 455/129
(58) **Field of Search** 455/129, 121, 455/125, 550, 90

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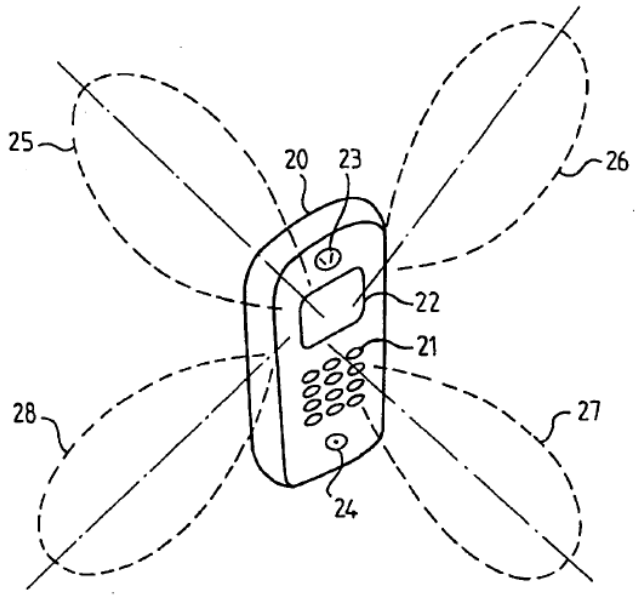
(57) **ABSTRACT**

A radio communication apparatus includes a transceiver coupled to an antenna structure with many directional antennas that form a radiation pattern. The antenna structure gives greater importance to certain directions of transmission. A power regulation device is controlled by a control element for modifying the radiation pattern. The control element includes switches for selectively activating/deactivating the directional antennas to modify the radiation pattern. A proximity detection device measures at least one proximity parameter and feeds the control element with a proximity indication for controlling the power regulation device to reduce the radiation pattern in the direction of the radio communication apparatus user. The proximity detection device includes a humidity and/or a temperature detector.

12 Claims, 3 Drawing Sheets



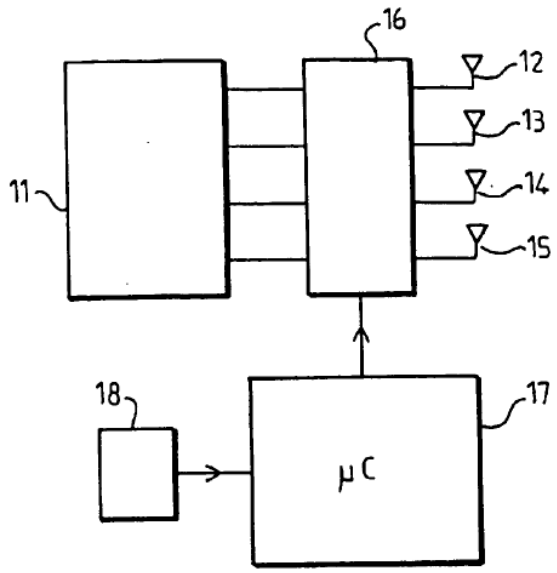


FIG.1

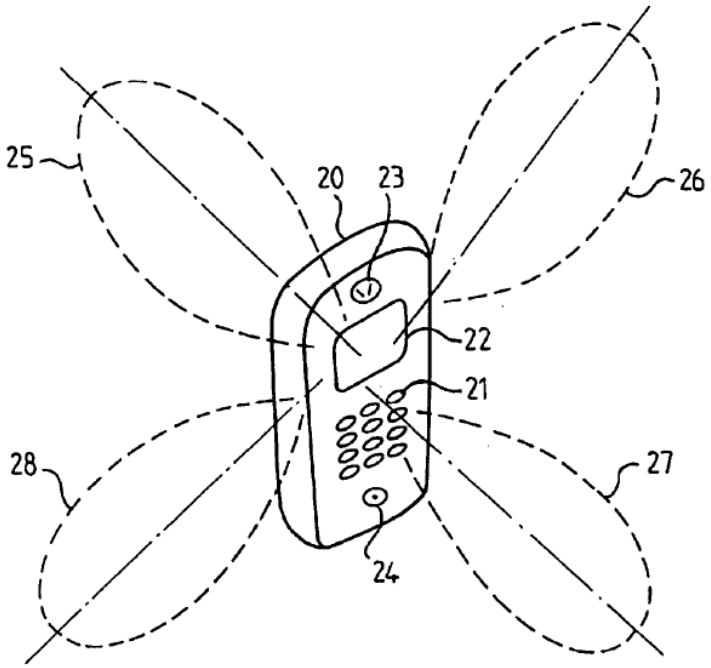


FIG.2

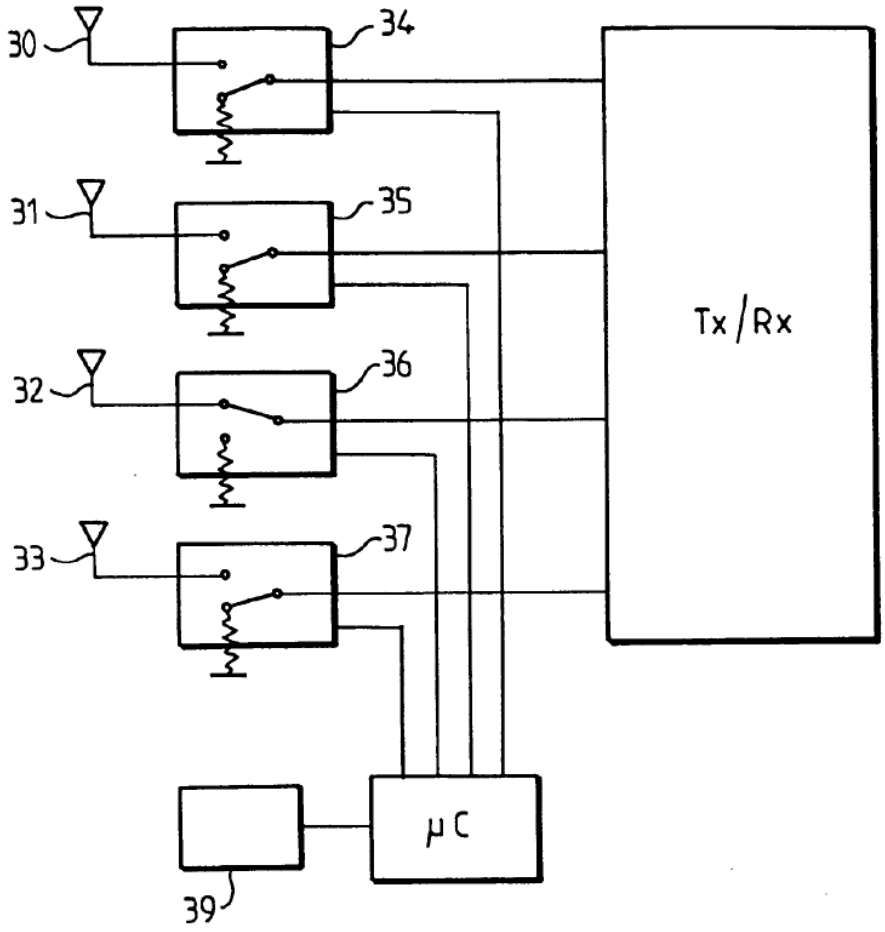


FIG. 3

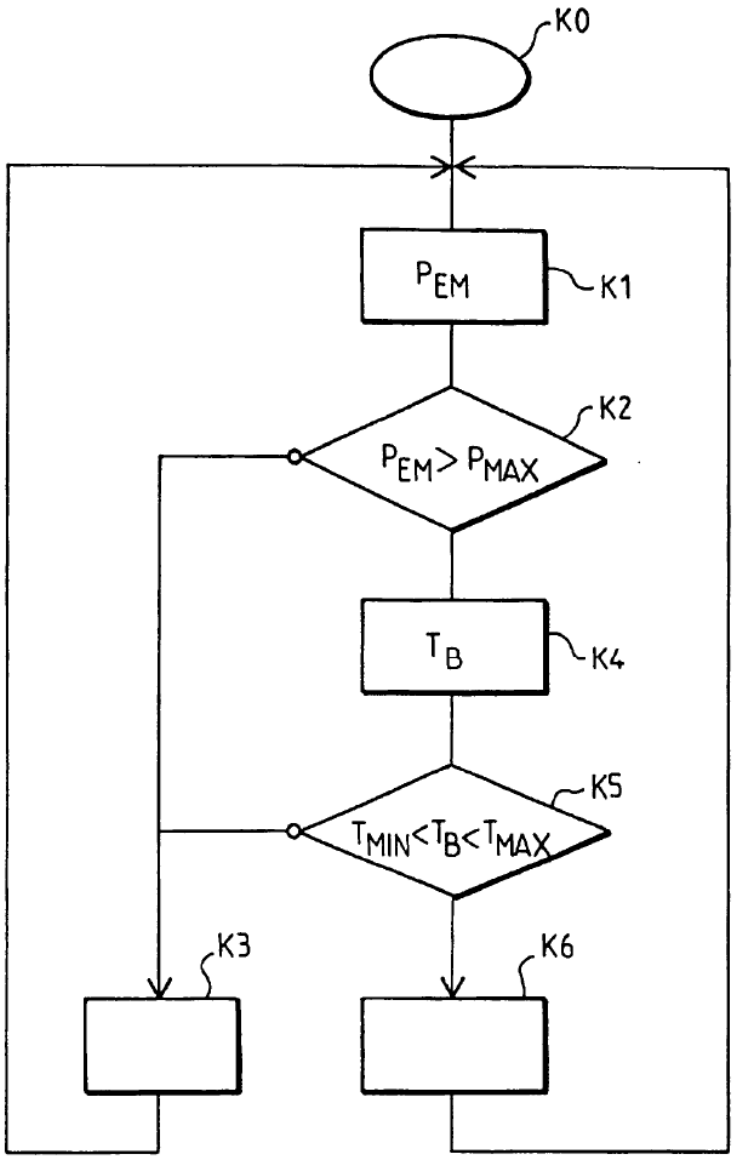


FIG.4

MOBILE RADIO EQUIPMENT FORMING ANTENNA PATTERN TO PROJECT USER FROM RADIATION

FIELD OF THE INVENTION

The invention relates to a radio communication apparatus comprising:

- transceiver means coupled to an antenna structure featuring a radiation diagram which antenna structure gives greater importance to certain directions of transmission and
- a power regulation device controlled by a control element for modifying said radiation diagram.

The invention also relates to mobile radio equipment suitable for communicating with at least one radio base station of a radio telecommunication system, said equipment comprising:

- radio transceiver means coupled to an antenna structure featuring a radiation diagram which antenna structure gives greater importance to certain directions of transmission and
- a power regulation device controlled by a control element for modifying said radiation diagram.

The invention further relates to a radio base station of a radio telecommunication system suitable for communicating with at least one mobile radio terminal, said station comprising:

- radio transceiver means coupled to an antenna structure featuring a radiation diagram which antenna structure gives greater importance to certain directions of transmission and
- a power regulation device controlled by a control element for modifying said radiation diagram.

The invention finally relates to a power control method for controlling the power radiated in a given direction by a plurality of directional antennas which have respective transmit powers.

The invention finds many applications in the field of telecommunication by radio channel, notably radiotelephony. The invention particularly applies to systems called third generation systems, operating according to a Universal Mobile Telecommunications System (UMTS) standard using the technique of Code-Division Multiple Access (CDMA). Equipment provided for such systems comprises a plurality of directional antennas suitable for emitting noxious radiation absorbed by human tissue situated in the proximity of these apparatus.

BACKGROUND OF THE INVENTION

European patent application no. EP 752 735, published in the German language, describes an apparatus of the type defined in the opening paragraph, comprising means for limiting the power of radiation absorbed by human tissue. The apparatus comprises an antenna array electrically connected to a control unit for individually regulating the transmit power of each antenna as a function of the calculated variation between the impedance measured at the level of the antenna and a reference value corresponding to its impedance in the clear field. This difference represents a measure of the radiation power absorbed by human tissue.

SUMMARY OF THE INVENTION

The present invention proposes means for avoiding the emission of radio waves in the direction of human tissue, which means are easier to implement and more effective than those described in cited document. Therefore, an apparatus as mentioned in the opening paragraph is provided, characterized in that it comprises a proximity detection device for measuring at least one proximity parameter and feeding the control element with a proximity indication for controlling the power regulation device.

According to an important characteristic feature of the invention, the antenna structure comprises a plurality of directional antennas which have each a transmit power in a given direction and the power regulation device comprises power control means for regulating the transmit power of the directional antennas.

According to another characteristic feature of the invention, the power control means comprise a switch for selectively activating/deactivating one or various directional antennas.

According to two particular embodiments of the invention, the proximity detection device comprises a temperature detector and/or a humidity detector enabling to distinguish, among the various obstacles to the radio propagation, the presence of a human being in any obstacle. As it is an object of the invention to limit the emission of noxious radiation for the benefit of the user's health, it is very advantageous to use such proximity detectors.

These detectors further feature two additional advantages. As they are passive, they are harmless to the user, because they emit no radio wave at all. Moreover, they make both the transmit power measurements and the calculations of the power differences recommended by the method cited previously redundant. These detectors are not only energy consumers but are also noxious, since they imply to transmit at a certain power level for making the measurements before possibly effecting a power level control intended to limit the user's absorption of radiation.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

In the drawings:

FIG. **1** is a block diagram of a communication apparatus according to the invention,

FIG. **2** represents an example of the mobile radio equipment according to the invention,

FIG. **3** is a block diagram of a particular embodiment of the equipment represented in FIG. **2**, and

FIG. **4** is a flow chart for illustrating an example of a method of controlling transmit power according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

The example represented in FIG. **1** may be integrated with a radiotelephone using various directional transmitting antennas. The communication apparatus comprises a transceiver device **11** coupled to a plurality of directional antennas **12** to **15** (having a radiation diagram giving greater importance to certain directions of transmission). Each antenna is electrically connected to a power regulation device **16** controlled by a control element **17**. Such an element may be formed by a suitably programmed microcontroller μC which includes a programmable read-only memory, a random-access memory, an input/output interface having an analog/digital converter and a digital/analog converter and all the devices necessary for the interface with the various peripherals.

A proximity detector **18** connected to the control element **17** detects the presence of human tissue in the proximity of the apparatus by measuring a proximity parameter, such as temperature or degree of humidity, and transmits a proximity coefficient characteristic of the detected object to the control element **17**. Such a detector is thus capable of differentiating between a human body featuring a certain coefficient and another body having a different coefficient. The value of this coefficient is analyzed by the control element **17** and compared to set values stored in, for example, the read-only memory to determine, in dependence on their preferred directions of transmission, which are the directional antennas whose transmit power is to be reduced and to trigger an appropriate control of the power regulation device **16**.

Under the control of the control element **17**, the power regulation device **16** selects one or various antennas and adjusts their transmit power as a function of the data produced by the detector **18**.

On reception, when the generated powers are considerably smaller than on transmission, all the directions of radiation may be used without a danger to the user.

According to a preferred embodiment of the invention, the proximity detector **18** is a passive type of infrared thermometer, capable of measuring the temperature of a body at a distance of about 20 cm from the detector. A variant consists of the use of a humidity detector.

Preferably, the power regulation device **16** comprises a switch (not shown) controlled by the control element **17** for individually activating or deactivating the selected antennas and radically suppressing the contribution of the deactivated antennas whose radiation diagram features a lobe in the direction of transmission to be avoided.

FIG. **2** is a perspective view of a radiotelephone comprising a structure of an antenna operating in the transceiving mode whose radiation diagram, simplified by main lobes, is represented by dotted lines. The use of separate antennas for transmission and reception is advocated when the frequency bands used for transmission and reception respectively, are too far away for them to be compatible with the passband of the antennas. On the other hand, the size of the apparatus is to be adapted to accommodate a large number of antennas, which is actually the case with equipment operating with frequencies in the gigahertz domain.

The example illustrated by FIG. **2** comprises a housing **20**, a keyboard **21**, a control display **22**, an earphone **23**, a microphone **24** and an antenna structure comprising four independent directional transmitting antennas situated inside the housing **20**. These antennas are formed by, for example, ceramic discs which form a radiation diagram whose main lobes **25**, **26**, **27**, **28** point in four orthogonal directions. In lieu of a system with various independently controllable antennas, one may use an adjustable miniaturized network antenna of the "phased-array type" like the one described in detail in the manual "Mobile Antenna Systems Handbook", K. Fujimoto et al., Artech House Inc., 1994, pp. 436–451.

FIG. **3** is a block diagram illustrating the operation of the radiotelephone represented in FIG. **2**. The antennas **30** to **33** are coupled, on the one hand, to transceiver circuits Tx/Rx by means of a duplexer, and on the other hand to switches **34** to **37** controlled by a control element μC as a function of data it receives from a proximity detector. The transceiver circuits known to a person of ordinary skill in the art will not be described here. It will be simply recollected that a transmitting circuit coupled to an antenna structure includes at least a power amplifier. In the case of a plurality of transmitting antennas, the radiotelephone is to comprise as many power amplifiers and transmitting circuits as there are antennas whose transmit power is to be controlled independently of the transmit power of the other antennas.

According to a preferred embodiment of the invention, the detection of human tissue by the proximity detector **39** triggers the control by the control element μC of the appropriate switches for deactivating the antennas whose radiation diagram points to the user's head. In the example with four antennas represented in FIG. **2**, the antenna producing the lobe **27** will generally have to be deactivated.

For a use in a propagation medium that gives greater importance to multiple paths and/or in a region where the density of the network of base stations is high, the suppression of the transmitting antennas featuring their main lobe in a given hemisphere does not considerably reduce the visibility of the base stations located in this hemisphere. In fact, in the first case the multiple reflections of the waves increase their probability to reach their target and in the second case the communication may be established with another available base station. Therefore, this embodiment is particularly suitable for a current use in an urban environment. On the other hand, for any other use, the addition of an omnidirectional antenna may turn out to be useful to avoid in this case losing contact with the only available base station.

According to another embodiment, each antenna is connected to its own transmitting circuit and the switches are replaced by attenuators controlled by the control element to adjust the transmit power of each antenna as a function of the result of the proximity detection. This embodiment requires that each antenna be connected to an adjustable power amplifier. As the amplifiers have a high energy consumption, this embodiment is reserved to equipment whose power consumption is not critical such as, for example, base stations of a mobile telecommunication system.

FIG. **4** illustrates a transmit power control method which can be realized by the control element **17** represented in FIG. **1** and integrated with the radiotelephone of FIG. **2** to control the power transmitted by a directional antenna structure.

The method starts at box **K0**. In box **K1**, the power P_{EM} transmitted by the radiotelephone is read. This power may be read, for example, on the output of the power amplifier of the transmitting circuit. In box **K2**, the value read P_{EM} is tested and compared to a set value P_{MAX} representing the maximum radiation power considered unharmful to the user. If the result of this test $P_{EM}>P_{MAX}$ is negative, the method proceeds with box **K3** where all the antennas are selected without a power regulation. If the result of the test is positive, the method proceeds with box **K4**, with a measuring step for measuring a proximity parameter for detecting the presence of a human being in the proximity of the apparatus. Depending on the preferred embodiment, this step consists of measuring the ambient temperature T_B with the aid of an infrared sensor sensitive to a distance of about 20 cm. The test carried out in box **K5** constitutes a comparison step between the measurement T_B carried out in the preceding step and set values T_{MIN} and T_{MAX}. If the equation $T_{MIN}<T_B<T_{MAX}$ is verified, step **K6** is proceeded to for selecting suitable antennas and regulating their transmit power. If not, box **K3** is returned to.

With the aid of examples a communication apparatus, telephony equipment, a base station and a power control method for modifying the radiation diagram of an antenna structure as a function of a proximity parameter have been described and illustrated. Of course it will be possible to provide variants of embodiment without leaving the scope of

the invention, notably as regards the choice of the proximity parameter to be detected and the choice of the antenna structure used.

What is claimed is:

1. A radio communication apparatus comprising:

a transceiver coupled to an antenna structure featuring a radiation diagram, said antenna structure giving greater importance to certain directions of transmission;

a power regulation device controlled by a control element for modifying said radiation diagram; and

a proximity detection device for measuring at least one proximity parameter and feeding the control element with a proximity indication for controlling the power regulation device, wherein the proximity detection device comprises a humidity detector.

2. An apparatus as claimed in claim 1, wherein the antenna structure comprises a plurality of directional antennas which have each a transmit power in a given direction and the power regulation device comprises power control means for regulating the transmit power of the directional antennas.

3. An apparatus as claimed in claim 2, wherein the power control means comprise a switch for selectively activating/deactivating one or various directional antennas.

4. An apparatus as claimed in claim 1, wherein the proximity detection device comprises a temperature detector.

5. Mobile radio equipment suitable for communicating with at least one radio base station of a radio telecommunication system, said equipment comprising:

a radio transceiver coupled to an antenna structure featuring a radiation diagram which antenna structure gives greater importance to certain directions of transmission;

a power regulation device controlled by a control element for modifying said radiation diagram; and

a proximity detection device for measuring at least one proximity parameter and applying to the control element an indication of proximity for controlling the power regulation device, wherein the proximity detection device comprises a humidity detector.

6. A radio base station of a radio telecommunication system suitable for communicating with at least one mobile radio terminal, said radio base station comprising:

a radio transceiver coupled to an antenna structure featuring a radiation diagram which antenna structure gives greater importance to certain directions of transmission;

a power regulation device controlled by a control element for modifying said radiation diagram; and

a proximity detection device for measuring at least one proximity parameter and applying to the control element a proximity indication for controlling the power regulation device, wherein the proximity detection device comprises a humidity detector.

7. A power control method for controlling the power radiated in a given direction by a plurality of directional antennas which have respective transmit powers comprising:

measuring of at least one proximity parameter including a humidity detector for forming a measured result to detect a presence of a human being in the proximity of the apparatus,

comparing said measured result to set values to form a comparison result, and

selecting at least one directional antenna for regulation of its transmit power as a function of the comparison result.

8. A radio communication apparatus comprising:

a transceiver coupled to a plurality of antennas having a radiation pattern;

a control element;

a power regulation device controlled by said control element for modifying said radiation pattern; and

a proximity detector which measures at least one proximity parameter, said proximity detector including a humidity detector and said at least one proximity parameter including a humidity parameter which indicates proximity of a user of said radio communication apparatus in a direction;

wherein said control element controls said power regulation device in response to said humidity parameter so that said radiation pattern is reduced in said direction.

9. The radio communication apparatus of claim 8, wherein said control element includes at least one switch for each one of said plurality of antennas for selectively deactivating at least one of said plurality of antennas that forms said radiation pattern in said direction.

10. The radio communication apparatus of claim 8, wherein said control element includes switches for selectively deactivating at least one of said plurality of antennas that forms said radiation pattern in said direction.

11. The radio communication apparatus of claim 8, wherein said control element includes attenuators for selectively attenuating at least one of said plurality of antennas that forms said radiation pattern in said direction.

12. The radio communication apparatus of claim 8, further comprising a plurality of adjustable gain amplifiers coupled to said plurality of antennas; said control element controlling at least one of said plurality of adjustable gain amplifiers to reduce said radiation pattern in said direction.

* * * * *

US006408187B1

(12) **United States Patent**
Merriam

(10) **Patent No.: US 6,408,187 B1**
(45) **Date of Patent: Jun. 18, 2002**

(54) **METHOD AND APPARATUS FOR DETERMINING THE BEHAVIOR OF A COMMUNICATIONS DEVICE BASED UPON ENVIRONMENTAL CONDITIONS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/312,318**

(22) Filed: **May 14, 1999**

(51) **Int. Cl.**[7] **H04Q 7/20**
(52) **U.S. Cl.** **455/458**; 455/67.7; 455/567
(58) **Field of Search** 455/31.1, 31.2, 455/38.2, 38.4, 38.5, 575, 226.1, 226.2, 227, 67.1, 67.3, 67.7, 421, 458, 567; 340/870.09, 573.4, 582, 571, 506, 519, 540, 545.4

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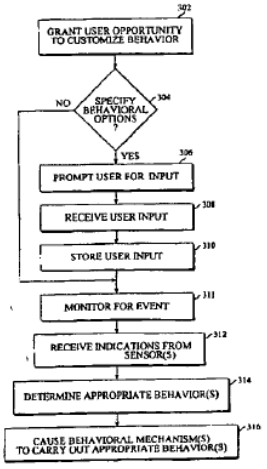
(57) **ABSTRACT**

A method and apparatus are disclosed for automatically determining the behavior of a communications device based upon the likelihood that a user is within relatively close proximity to the communications device. The apparatus comprises one or more sensors, one or more behavioral mechanisms, and a behavior determining mechanism. The sensors (which may, for example, be mechanical, audio, heat, or motion sensors) provide indications as to the likelihood that a user is within relatively close proximity to the communications device. These indications are received by the behavior determining mechanism, and in response, the behavior determining mechanism determines, based upon the indications, one or more appropriate behaviors for the apparatus. The behavior determining mechanism then causes one or more of the behavioral mechanisms to carry out the appropriate behaviors. By taking into account the likelihood that a user is within relatively close proximity to the communications device, the apparatus of the present invention enables the communications device to adapt its behavior to conform to its immediate environment. Thus, for example, if a communications device is situated in a room in which a meeting is being conducted, it will not issue an audio alert in response to an incoming communication. Instead, it will issue an alternate alert, such as a visual alert or a vibrating alert, to avoid disrupting the meeting. This and many other applications are possible with the present invention.

27 Claims, 3 Drawing Sheets



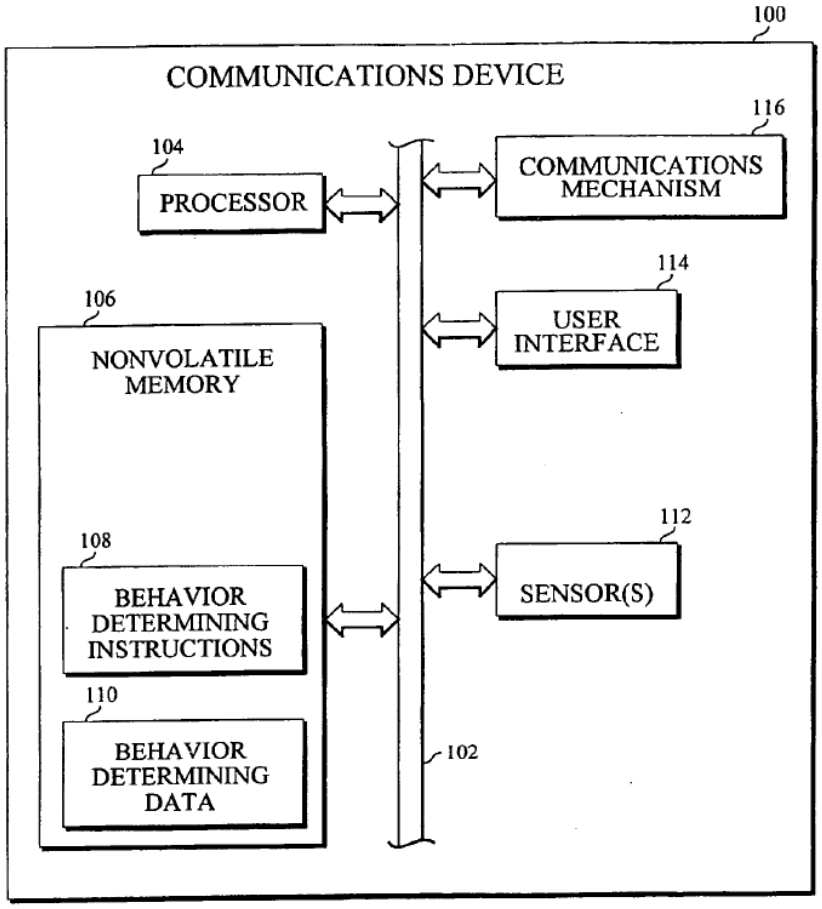


Fig. 1

110

SENSOR/STATUS	BEHAVIOR
MECHANICAL SENSOR (AFFIRMATIVE)	VIBRATE; FORWARD
MECHANICAL SENSOR (NEGATIVE)	VISUAL ALERT; AUDIO ALERT
AUDIO SENSOR (AFFIRMATIVE)	VIBRATE; VISUAL ALERT
AUDIO SENSOR (NEGATIVE)	AUDIO ALERT; FORWARD
MOTION SENSOR (AFFIRMATIVE)	VIBRATE; VISUAL ALERT
MOTION SENSOR (NEGATIVE)	AUDIO ALERT; FORWARD
HEAT SENSOR (AFFIRMATIVE)	VIBRATE; VISUAL ALERT
HEAT SENSOR (NEGATIVE)	AUDIO ALERT; FORWARD
AUDIO SENSOR (AFFIRMATIVE) & MOTION SENSOR (AFFIRMATIVE)	VIBRATE; VISUAL ALERT; FORWARD
AUDIO SENSOR (AFFIRMATIVE) & MOTION SENSOR (NEGATIVE)	VIBRATE; VISUAL ALERT; AUDIO ALERT; FORWARD
⋮	⋮

Fig. 2

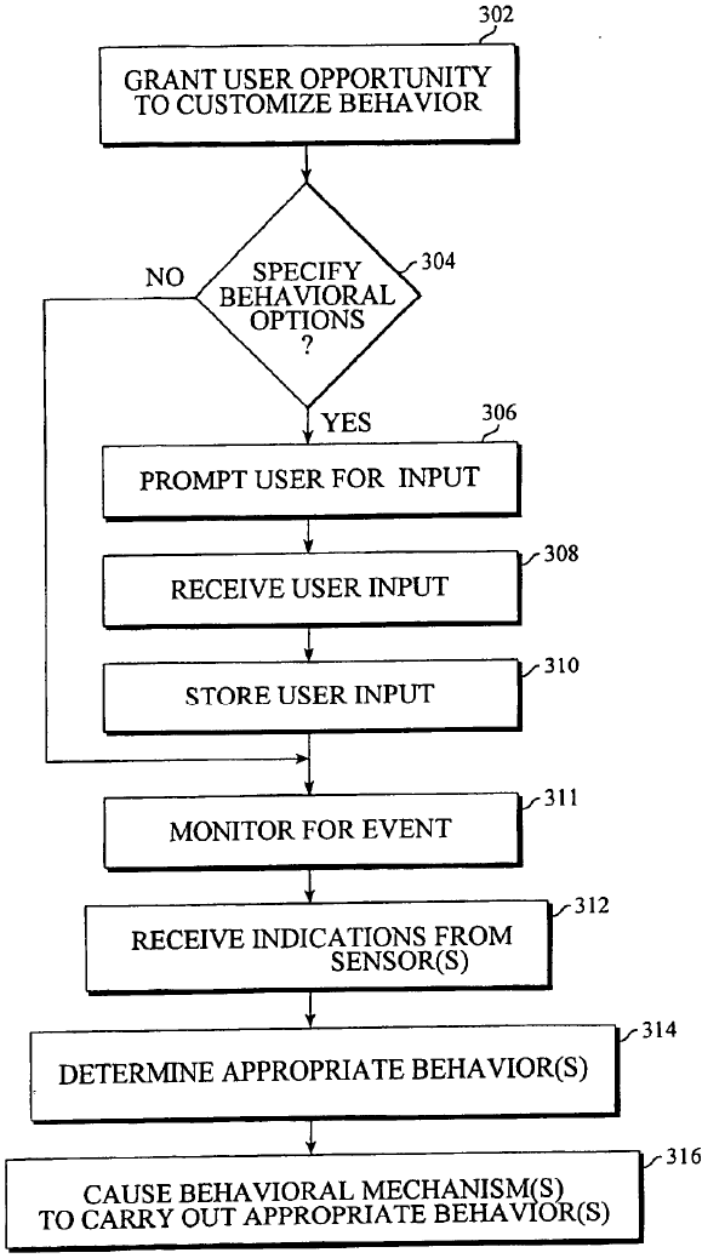


Fig. 3

METHOD AND APPARATUS FOR DETERMINING THE BEHAVIOR OF A COMMUNICATIONS DEVICE BASED UPON ENVIRONMENTAL CONDITIONS

BACKGROUND

This invention relates generally to communications systems and more particularly to a method and apparatus for determining the behavior of a communications device based upon the current proximity of a user to the device.

Due to improved technology, lower cost, and larger service areas, the use of portable communications devices, such as mobile telephones and pagers, has greatly proliferated in recent years. One of the factors that has contributed to the popularity of portable communications devices has been the freedom that they afford their users. With portable communications devices, people are no longer required to stay in particular locations to wait for important phone calls. Rather, they are free to conduct their lives and their business as usual, knowing that they can almost always be reached by way of their portable devices. With mobile phones and pagers, busy executives are able to conduct business even when they are in their cars, in a plane, etc., and field personnel are able to work in the field without being "out of touch" with the home office.

While portable communications devices do offer significant mobility advantages, they do not come without their drawbacks. One of the drawbacks is that of untimely interruption and disruption. For example, it is not an unusual occurrence for a mobile phone or a pager to ring or beep during an important meeting. When this happens, it disrupts the flow of the meeting and, in many instances, annoys the participants of the meeting. If several of the participants have portable communications devices (which is not uncommon), and if each device rings or beeps even once, the flow and the effectiveness of the meeting can be significantly disrupted and even undermined.

Some device manufacturers have tried to alleviate this problem by providing a vibrating mechanism with their devices which allows the devices to alert a user of an incoming communication by vibrating instead of ringing or beeping. While this mechanism does minimize the disruption caused by audio alerts, it is effective only if the user remembers to invoke it prior to the meeting. If the user forgets to invoke vibrating mode, then the audio alert of the portable device will sound and disrupt the meeting in the same manner as before. Hence, vibrating mode in and of itself is not an adequate solution. What is needed instead is a mechanism that automatically determines, based upon certain factors, how a communications device should behave at any particular time. Such a mechanism is not believed to be currently available.

SUMMARY OF THE INVENTION

The present invention is based, at least partially, upon the observation that much of the proper behavior of a communications device can be determined based upon whether a user is within relatively close proximity to the device. For example, if a communications device is attached to the belt of a user and hence is within close proximity to the user, then there is no need for the device to produce an audio alert when an incoming communication is received. Instead, a vibration or a visual alert (e.g. a flashing light or a display) will suffice. On the other hand, if the user is not close to the device, then an audio alert or another action (such as forwarding the communication to another device) may be appropriate. As this discussion shows, the proximity of a user to the communications device is often determinative of the proper behavior of the device. Based upon this observation, the present invention provides a mechanism for automatically determining the behavior of a communications device based upon the likelihood that a user is within relatively close proximity to the communications device.

According to one embodiment, an apparatus of the present invention comprises one or more sensors, one or more behavioral mechanisms, and a behavior determining mechanism. Each sensor (which may, for example, be a mechanical, audio, heat, or motion sensor) monitors the environment surrounding the communications device and provides an indication as to the likelihood that a user is within relatively close proximity to the communications device. For purposes of the present invention, a sensor is required to provide only an indication of likelihood that a user is within relatively close proximity to the communications device; it need not make an absolute determination as to the presence of a user. This indication of likelihood is used by the behavior determining mechanism to determine the behavior of the communications device.

More specifically, the behavior determining mechanism receives the indications from the sensors and, based upon the indications, determines one or more appropriate behaviors for the communications device. In one embodiment, this determination is made by consulting a behavioral table which sets forth the behaviors of the communications device under specific indications conditions. The values in the behavioral table can be specified by a user. This allows the user to customize the behavior of the communications device.

Once the one or more appropriate behaviors for the communications device have been determined, the behavior determining mechanism causes the one or more behavioral mechanisms to carry out the appropriate behaviors. This may, for example, involve activating a vibrating alert mechanism to cause the communications device to vibrate, or activating a visual alert mechanism to cause a message to be displayed or a light to flash, or activating a communication forwarding mechanism to cause a communication to be forwarded to another communications device, or causing an audio alert mechanism to activate or not activate. These and many other behaviors and behavioral mechanisms are possible. Which behaviors are carried out will depend upon the likelihood that a user is within relatively close proximity to the communications device. By taking user proximity into account, the present invention enables the communications device to automatically adapt its behavior to conform to its immediate environment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram representation of a communications device wherein one embodiment of the present invention is implemented.

FIG. **2** illustrates a table in which behavioral determining information is stored in accordance with one embodiment of the present invention.

FIG. **3** is a flow diagram illustrating the operation of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENT(s)

With reference to FIG. **1**, there is shown a communications device **100** in which one embodiment of the present

invention is implemented. For purposes of the present invention, communications device **100** may be any device capable of sending and/or receiving communications and/or information, including but not limited to, a telephone (mobile or land line), a pager, an electronic mail enabled device, a facsimile machine, a computer (portable or non-portable), and audio/video conferencing equipment.

Communications device **100** comprises a main bus **102** and a plurality of components coupled to the main bus **102**, including a processor **104** and a non-volatile memory **106**. Non-volatile memory **106** contains therein a set of behavior determining instructions **108** which are executed by the processor **104** to carry out the methodology of the present invention, and a set of behavior determining data **110**. As explained further below, the data **110** is user specifiable, and is used to determine the appropriate behavior for the communications device **100**. Together, the processor **104** and the instructions **108** form a behavior determining mechanism. In this embodiment, the functionality of the invention is derived from the processor **104** executing the program instructions **108**; however, it should be noted that the invention is not so limited. If so desired, the functionality of the present invention may be achieved by way of hardwired logic components. This and other modifications are within the scope of the invention.

Communications device **100** further comprises one or more sensors **112** coupled to the main bus **102**. The purpose of the sensors **112** is to monitor the environment surrounding the communications device **100** and to provide indications as to the likelihood that a user is currently within relatively close proximity to the device **100**. These indications allow the behavior determining mechanism (the processor **104** executing the instructions **108**) to determine the likelihood that a user is actually within relatively close proximity to the device **100**, and to determine the behavior of the device **100** accordingly.

According to the present invention, a sensor **112** may be any of a number of different mechanisms. For example, sensor **112** may be a mechanical sensor such as a button on a belt clip which is depressed when the communications device **100** is not clipped to a belt, and released when the communications device **100** is clipped to a belt. When the button is released, thereby indicating that the device **100** is clipped to a belt, and hence indicating a likelihood that the device **100** is within relatively close proximity to a user, the mechanical sensor **112** provides an affirmative indication of likelihood. On the other hand, if the button is depressed, then the mechanical sensor **112** provides a negative indication of likelihood.

The sensor **112** may also be an audio sensor which senses audio signals (voices, noise, sounds, etc.) around the communications device **100**. If audio signals of sufficient strength are detected, then there is a likelihood that a user is within relatively close proximity to the communications device **100**. Hence, the audio sensor provides an affirmative indication of likelihood. On the other hand, if no audio signals or very low-strength audio signals are detected, then the audio sensor **112** provides a negative indication of likelihood.

The sensor **112** may also be a heat sensor for detecting the body heat of a nearby user. If sufficient body heat is detected, thereby indicating a likelihood that a user is within relatively close proximity to the communications device **100**, then the heat sensor **112** provides an affirmative indication of likelihood. Otherwise, the heat sensor **112** provides a negative indication of likelihood.

In addition, the sensor **112** may be a motion sensor for detecting motion around the vicinity of the communications device **100**. If motion is sensed, thereby indicating a likelihood that a user is within relatively close proximity to the device **100**, then the motion sensor **112** outputs an affirmative indication of likelihood. If no motion is sensed, then the motion sensor **112** outputs a negative indication of likelihood.

Further, the sensor **112** may be a proximity sensor, such as an infrared based sensor, for detecting whether an object is within a certain distance of the sensor **112**. If so, then there is a likelihood that a user is within relatively close proximity to the device **100**. In such a case, the proximity sensor **112** outputs an affirmative indication of likelihood. If not, then the proximity sensor **112** outputs a negative indication of likelihood.

The above are just some of the possible embodiments of the sensor **112**. Many more are possible. For purposes of the present invention, any sensing mechanism that is capable of providing an indication as to the likelihood that a user is within relatively close proximity to the communications device **100** can be used as the sensor **112**. A point to note regarding the sensors **112** is that, in the present invention, they are not required to make an absolute determination as to the presence of a user. Rather, they need to provide only an indication of likelihood that a user is within relatively close proximity to the communications device. Because the sensors **112** deal with likelihood, and hence probabilities, there is a potential for error (i.e. the sensors may provide an affirmative indication of likelihood even when no user is within close proximity to the communications device). To lessen the possibility for error, multiple types of sensors **112** (e.g. an audio sensor and a motion sensor) may be used to check for multiple indicia of a user's presence. This is within the scope of the present invention.

In addition to the sensors **112**, communications device **100** further comprises a user interface **114**, and a communications mechanism **116**, both of which are coupled to the main bus **102**. The user interface **114** comprises all components necessary for receiving input from and providing output to the user, including for example a microphone, a speaker, and a keypad. The interface **114** further comprises mechanisms for alerting users of incoming communications, including an audio alert mechanism (e.g. a ringer), a vibrating mechanism, and a visual alert mechanism (e.g. a display or a blinking or flashing light). As described further below, these mechanisms may be invoked as behavioral mechanisms to carry out appropriate behaviors for the communications device **100**. As to the communications mechanism **116**, it comprises all components necessary for communicating with other entities (such as base stations and other communications devices) including a transmitting mechanism and a receiving mechanism. As described further below, mechanism **116** may also be invoked as a behavioral mechanism to carry out appropriate behaviors for device **100**. In addition to user interface **114** and communications mechanism **116**, device **100** may further comprise other behavioral mechanisms, each mechanism imparting a certain behavior to the communications device **100**. Such other behavioral mechanisms are within the scope of the present invention.

As mentioned previously, the particular behavior or behaviors carried out by the communications device **100** is determined by the behavior determining data **110** stored in the non-volatile memory **106**. According to one embodiment, data **110** is freely specifiable by a user. By making data **110** user specifiable, the present invention

enables a user to customize the behavior of the communications device **100**. This aspect of the invention will be described in greater detail in a later section.

With reference to FIG. **2**, there is shown one embodiment of the behavior determining data **110**, wherein the data takes the form of a behavioral table **110** having two columns: (1) a sensor/status column; and (2) a behavior column. In each row of the behavioral table **110**, there is stored an identification of a particular sensor (e.g. the mechanical sensor) and an indication status associated with that sensor (e.g. affirmative or negative), and one or more behaviors. This information specifies how the communications device **100** should behave in response to specific indications of likelihood from specific sensors.

For example, if an audio sensor detects strong audio signals around the communications device **100** and hence, outputs an affirmative indication of likelihood, then in response to a particular event, such as an incoming communication, the communications device **100** should, according to table **110**, first vibrate to alert the user, and then if the user does not respond within a certain period of time, to activate a visual alert. No audio alert is sounded. On the other hand, if the audio sensor detects no audio signals around the communications device and hence, outputs a negative indication of likelihood, then the communications device **100** should, according to table **110**, respond to a particular event such as an incoming communication by first sounding an audio alert, and then if the user does not respond within a certain period of time, forwarding the communication to another device. In this manner, the behavioral table **110** enables the communications device **100** to adapt its behavior, based upon the likelihood that a user is within relatively close proximity to the device **100**, to conform to its immediate environment.

As an enhancement, the information in the sensor/status column may contain the identification and status indication for multiple sensors. For example, as shown in the ninth row of table **110**, the table **110** may specify that if both the audio sensor and the motion sensor output affirmative indications of likelihood, then the proper behavior for the communications device **100** should be to vibrate first, then to activate a visual alert, and then to forward a communication. The advantage of including multiple sensors/status information in the same row is that it allows the communications device **100** to take multiple types of sensors into account in determining the appropriate behavior for the device **100**. As mentioned previously, the more types of sensors that are taken into account, the greater the chance of making a correct determination as to whether a user is actually within close proximity to the communications device **100**. This is within the scope of the present invention.

With reference to the flow diagram of FIG. **3**, the operation of the apparatus of the present invention will now be described. Under direction of the behavior determining instructions **108** stored in volatile memory **106**, the processor **104** begins operation by granting **(302)** the user an opportunity to initialize or update the behavioral table **110**. This gives the user the opportunity to customize the behavior of the communications device **100**. If the user indicates that he does not wish to update the behavioral table **110**, then processor **104** proceeds to **(311)**. Otherwise, processor **104** proceeds to **(306)**.

Processor **104** begins the update process by prompting **(306)** the user for input. This is carried out by first displaying to the user via the user interface **114** an identification of a sensor **112** available in the communications device **100** and a possible indication status for that sensor (e.g. mechanical sensor (affirmative)), and then providing the user a list of choices for possible behaviors (e.g. vibrate, audio alert, visual alert, forward). This in effects asks the user what the user would like the communications device **100** to do if that particular sensor produces that particular indication of likelihood. In response, the user selects via the user interface **114** one or more of the choices of possible behaviors. This user input is received **(308)** by the processor **104** and stored **(310)** into the behavioral table **110** in the non-volatile memory **106**. In this manner, one of the rows of the behavioral table **110** is updated. Processor **104** repeats **(306)**, **(308)**, and **(310)** until the user has specified behaviors for all possible indications conditions (i.e. for all sensors in the communications device **100** and all possible status indications for the sensors). If multiple types of sensors are taken into account as is the case with the ninth and tenth entries in the table **110** of FIG. **2**, then behaviors will need to be specified for combinations of sensors and sensor status indications. The behavioral table **110** is thus populated.

Thereafter, processor **104** proceeds to **(311)** to monitor for the occurrence of a particular event, such as the reception of an incoming communication. When such an event is detected, processor **104** receives **(312)** indications of likelihood from the various sensors in the communications device. These indications of likelihood provide to the processor **104** a sense of the likelihood that a user is within relatively close proximity to the communications device **100**. Using these indications, processor **104** consults the behavioral table **110** to determine **(314)** the appropriate behavior or behaviors for the communications device **100**.

Once the appropriate behaviors have been determined, processor **104** causes **(316)** the appropriate behavioral mechanisms to carry out the appropriate behaviors. This may involve, for example: (1) activating the vibrating mechanism in the user interface **114** to cause the communications device **100** to vibrate; (2) activating the visual alert mechanism in the user interface **114** to cause a message to be displayed or a light to flash; (3) activating or not activating the audio alert mechanism in the user interface **114**; or (4) activating the communications mechanism **116** to contact a base station to instruct the base station to forward the incoming communication to another communications device. These and other behaviors are within the scope of the present invention.

In the manner described, the apparatus of the present invention effectively adjusts the behavior of the communications device **100** based upon whether a user is likely to be within relatively close proximity to the device **100**. By doing so, the present invention enables the device **100** to automatically adapt its behavior to conform to its immediate environment. Thus, for example, if the communications device **100** is situated in a room in which a meeting is being conducted, then the device **100** will not ring in response to an incoming communication. Instead, it will use a less disruptive alerting mechanism, such as a vibrating mechanism or a visual alert mechanism. As a result, the meeting is not disrupted. This is just one of the advantageous uses of the present invention. There are many others. These other uses will be clear to those of ordinary skill in the art with the benefit of this disclosure.

Thus far, the present invention has been described with an emphasis towards determining whether a user is within relatively close proximity to the communications device. While this is an advantageous implementation of the concept of the invention, it should be noted that the invention may be applied more broadly. Specifically, the present invention

may be generalized to automatically adjusting the behavior of a communications device based upon the surrounding environment in which the communications device is situated. This may take into account more factors than just whether a user is within close proximity to the communications device. As an example, the present invention may be used to automatically adjust the volume of a ringer based upon the environment surrounding the communications device. For example, if an audio sensor senses a high amount of noise around the communications device, then the behavior determining mechanism **108** may increase the volume of a ringer to enable the ringer to be heard over the noise. As a further example, if a proximity sensor senses that the communications device is in a confined space (such as a purse), then the behavior determining mechanism **108** may increase the volume of the ringer to enable the ringer to be heard despite the fact that the communications device is in a purse. Neither of these factors are closely related to whether a user is within close proximity to the communications device. As this discussion shows, the present invention is quite general. It may be applied to any situation in which it is desirable to adjust the behavior of a communications device based upon the environment in which the device is currently situated. All such applications are within the scope of the present invention.

At this point, it should be noted that although the invention has been described with reference to specific embodiments, it should not be construed to be so limited. Various modifications can be made by those of ordinary skill in the art with the benefit of this disclosure without departing from the spirit of the invention. Thus, the invention should not be limited by the specific embodiments used to illustrate it but only by the scope of the appended claims.

What is claimed is:

1. A method implemented by a communications device for alerting a user of the communications device to an incoming communication, comprising:

receiving an incoming communication intended for the user of the communications device;

determining one or more environmental conditions of a current environment surrounding the communications device;

selecting, based upon said environmental conditions, one or more appropriate mechanisms, from a plurality of alert mechanisms, to invoke to alert the user of said incoming communication; and

alerting the user by invoking said one or more appropriate mechanisms.

2. The method of claim **1**, wherein said incoming communication comprises one of the members of a group consisting of: a telephone call, a page, an audio transmission, a video transmission, a data transmission, and a text message.

3. The method of claim **1**, wherein said environmental conditions comprise one or more of the members of a group consisting of: amount of noise around the communications device, amount of body heat near the communications device, motion around the communications device, whether there are objects within close proximity to the communications device, and whether the user is in physical contact with the communications device.

4. The method of claim **1**, wherein determining comprises:

receiving information from at least one environmental sensor.

5. The method of claim **4**, wherein determining comprises:

receiving information from a plurality of environmental sensors.

6. The method of claim **1**, wherein alerting comprises:

invoking a plurality of said appropriate mechanisms.

7. The method of claim **1**, wherein:

determining comprises:

determining whether the communications device is in physical contact with the user;

selecting comprises:

selecting a mechanical alert mechanism if the communications device is in physical contact with the user; and

alerting comprises:

invoking said mechanical alert mechanism.

8. The method of claim **7**, wherein said mechanical alert mechanism comprises a vibration mechanism.

9. The method of claim **1**, wherein:

determining comprises:

determining a noise level for said current environment;

selecting comprises:

selecting a mechanical alert mechanism if said noise level exceeds a certain threshold; and

alerting comprises:

invoking said mechanical alert mechanism.

10. The method of claim **1**, wherein:

determining comprises:

determining a noise level for said current environment;

selecting comprises:

selecting a visual alert mechanism if said noise level exceeds a certain threshold; and

alerting comprises:

invoking said visual alert mechanism.

11. The method of claim **1**, wherein:

determining comprises:

determining an amount of body heat in said current environment;

selecting comprises:

selecting a mechanical alert mechanism if said amount of body heat exceeds a certain threshold; and

alerting comprises:

invoking said mechanical alert mechanism.

12. The method of claim **1**, wherein:

determining comprises:

determining there is motion in said current environment;

selecting comprises:

selecting a mechanical alert mechanism if there is motion in said current environment; and

alerting comprises:

invoking said mechanical alert mechanism.

13. The method of claim **1**, wherein:

determining comprises:

determining there is motion in said current environment;

selecting comprises:

selecting a visual alert mechanism if there is motion in said current environment; and

alerting comprises:

invoking said visual alert mechanism.

14. The method of claim **1**, wherein:

determining comprises:

determining whether said current environment is a confined space;

selecting comprises:

selecting an audio alert mechanism if said current environment is a confined space; and

alerting comprises:

invoking said audio alert mechanism at a higher than average volume.

15. The method of claim 1, further comprising:

determining whether the user has received said incoming communication; and

forwarding said incoming communication to another communications device if the user has not received said incoming communication.

16. A communications device, comprising:

a communications mechanism for receiving an incoming communication intended for a user of said communications device;

one or more sensors, each sensor providing an indication of one or more environmental conditions of a current environment surrounding said communications device;

a plurality of alert mechanisms for alerting the user to said incoming communication; and

a behavioral determining mechanism coupled to said one or more sensors and said plurality of alert mechanisms, said behavior determining mechanism selecting, based upon said one or more environmental conditions, one or more of said plurality of alert mechanisms as being appropriate mechanisms for alerting the user to said incoming communication, and invoking said appropriate mechanisms.

17. The communications device of claim **16**, wherein said incoming communication comprises one of the members of a group consisting of: a telephone call, a page, an audio transmission, a video transmission, a data transmission, and a text message.

18. The communications device of claim **16**, wherein said environmental conditions comprise one or more of the members of a group consisting of: amount of noise around the communications device, amount of body heat near the communications device, motion around the communications device, whether there are objects within close proximity to the communications device, and whether the user is in physical contact with the communications device.

19. The communications device of claim **16**, wherein said communications device comprises a plurality of sensors, with each sensor providing an indication of a different environmental condition.

20. The communications device of claim **16**, wherein said one or more sensors comprises a mechanical sensor for sensing whether said communications device is in physical contact with the user, wherein said plurality of alert mechanisms comprises a mechanical alert mechanism, and wherein said behavior determining mechanism selects and invokes said mechanical alert mechanism if said mechanical sensor indicates that said communications device is in physical contact with the user.

21. The communications device of claim **16**, wherein said one or more sensors comprises an audio sensor for sensing a noise level for said current environment, wherein said plurality of alert mechanisms comprises a mechanical alert mechanism, and wherein said behavior determining mechanism selects and invokes said mechanical alert mechanism if said audio sensor indicates that said noise level exceeds a certain threshold.

22. The communications device of claim **16**, wherein said one or more sensors comprises an audio sensor for sensing a noise level for said current environment, wherein said plurality of alert mechanisms comprises a visual alert mechanism, and wherein said behavior determining mechanism selects and invokes said visual alert mechanism if said audio sensor indicates that said noise level exceeds a certain threshold.

23. The communications device of claim **16**, wherein said one or more sensors comprises a heat sensor for sensing body heat in said current environment, wherein said plurality of alert mechanisms comprises a mechanical alert mechanism, and wherein said behavior determining mechanism selects and invokes said mechanical alert mechanism if said heat sensor indicates that said body heat exceeds a certain threshold.

24. The communications device of claim **16**, wherein said one or more sensors comprises a motion sensor for sensing motion in said current environment, wherein said plurality of alert mechanisms comprises a mechanical alert mechanism, and wherein said behavior determining mechanism selects and invokes said mechanical alert mechanism if said motion sensor indicates that there is motion in said current environment.

25. The communications device of claim **16**, wherein said one or more sensors comprises a motion sensor for sensing motion in said current environment, wherein said plurality of alert mechanisms comprises a visual alert mechanism, and wherein said behavior determining mechanism selects and invokes said visual alert mechanism if said motion sensor indicates that there is motion in said current environment.

26. The communications device of claim **16**, wherein said one or more sensors comprises a proximity sensor for sensing whether said current environment is a confined space, wherein said plurality of alert mechanisms comprises an audio alert mechanism, and wherein said behavior determining mechanism selects and invokes said audio alert mechanism at a higher than average volume if said proximity sensor indicates that said current environment is a confined space.

27. The communications device of claim **16**, wherein said behavior determining mechanism determines whether the user has received said incoming communication, and if not, said behavior determining mechanism causing said communications mechanism to forward said incoming communication to another communications device.

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OIPE JC154 OCT 07 2002 PATENT & TRADEMARK OFFICE

DOCKET NO. R.L. MCDOWELL 20-76 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

RECEIVED
OCT 08 2002
Technology Center 2600

Richard L. McDowell, et al.

Serial No.: 09/967,140

Filed: September 28, 2001

For: A PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF

Group: 2681

Examiner: N/A

PROCESSED
OCT 10 2002
TECH CENTER 2600

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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 977 304 A1

(12) DEMANDE DE BREVET EUROPEEN

(43) Date de publication:
02.02.2000 Bulletin 2000/05

(51) Int. Cl.[7]: **H01Q 1/24**, H04B 1/38, H01Q 3/24, H01Q 3/28

(21) Numéro de dépôt: **99202385.3**

(22) Date de dépôt: **20.07.1999**

(84) Etats contractants désignés:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Etats d'extension désignés:
AL LT LV MK RO SI

(30) Priorité: **28.07.1998 FR 9809651**

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(54) Appareil de communications, équipement radio mobile, station de base et procédé de contrôle de puissance

(57) L'invention concerne un appareil de communication de signaux radioélectriques équipé d'une structure d'antenne directive, notamment un radiotéléphone ou une station de base d'un système de téléphonie mobile. L'appareil comporte des moyens de mesure de paramètres d'environnement et des moyens de contrôle d'émission pour réguler la puissance d'émission de la structure d'antenne par rapport à la direction d'émission, en fonction de l'environnement. L'invention permet, par des moyens peu coûteux, de limiter considérablement la puissance des radiations nocives émises par un équipement radio en direction de tissus humains.

Application : radiotéléphones, stations radio de bases.

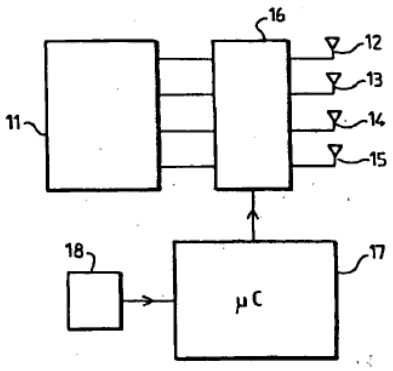

FIG.1

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2.16.7/3.6

Description

[0001] L'invention concerne un appareil de communication de signaux radioélectriques comportant:

- des moyens d'émission / réception couplés à une structure d'antenne présentant un diagramme de rayonnement privilégiant certaines directions en émission et
- un dispositif de régulation de puissance commandé par un organe de contrôle pour modifier ledit diagramme de rayonnement.

[0002] Elle concerne également un équipement radio mobile susceptible de communiquer avec au moins une station radio de base d'un système de télécommunications radioélectriques, ledit équipement comportant:

- des moyens d'émission / réception de signaux radioélectriques couplés à une structure d'antenne présentant un diagramme de rayonnement privilégiant certaines directions en émission et
- un dispositif de régulation de puissance commandé par un organe de contrôle pour modifier ledit diagramme de rayonnement.

[0003] L'invention concerne encore une station radio de base d'un système de télécommunications radioélectriques susceptible de communiquer avec au moins un terminal radio mobile, ladite station comportant :

- des moyens d'émission / réception de signaux radioélectriques couplés à une structure d'antenne présentant un diagramme de rayonnement privilégiant certaines directions en émission et
- un dispositif de régulation de puissance commandé par un organe de contrôle pour modifier ledit diagramme de rayonnement.

[0004] Elle concerne enfin un procédé de contrôle de puissance pour contrôler la puissance rayonnée dans une direction donnée par une pluralité d'antennes directives ayant des puissances d'émission respectives.

[0005] L'invention a de nombreuses applications dans le domaine des télécommunications par voie radio, notamment en radiotéléphonie. Elle s'applique particulièrement dans les systèmes, dits de troisième génération, fonctionnant selon une norme de type UMTS (de l'anglais Universal Mobile Telecommunications System) utilisant la technique de multiplexage large bande à répartition par code CDMA (de l'anglais Code Division Multiple Access). Des équipements prévus pour de tels systèmes comportent une pluralité d'antennes directives susceptibles d'émettre des radiations nocives absorbées par des tissus humains situés à proximité de ces appareils.

[0006] La demande de brevet européen publiée en langue allemande sous le numéro EP 752 735 décrit un appareil du genre mentionné dans le paragraphe introductif comportant des moyens pour limiter la puissance des radiations absorbées par le tissu humain. Il comporte un arrangement d'antennes électriquement relié à une unité de contrôle pour réguler individuellement la puissance d'émission de chaque antenne en fonction de la variation calculée entre l'impédance mesurée au niveau de l'antenne et une valeur de référence correspondant à son impédance en champ libre. Cette différence représente une mesure de la puissance de radiation absorbée par le tissu humain.

[0007] La présente invention propose des moyens pour éviter l'émission d'ondes radioélectriques en direction de tissus humains, plus simples à mettre en oeuvre et plus efficaces que ceux décrits dans le document cité. Pour cela, il est prévu un appareil tel que mentionné dans le paragraphe introductif, remarquable en ce qu'il comprend un dispositif de détection de proximité pour mesurer au moins un paramètre d'environnement et fournir à l'organe de contrôle une indication de proximité pour commander le dispositif de régulation de puissance.

[0008] Selon une caractéristique importante de l'invention, la structure d'antenne comprend une pluralité d'antennes directives ayant chacune une puissance d'émission dans une direction donnée et le dispositif de régulation de puissance comporte des moyens de contrôle de puissance pour réguler la puissance d'émission des antennes directives.

[0009] Selon une autre caractéristique de l'invention, les moyens de contrôle de puissance comprennent des moyens de commutation pour activer / désactiver sélectivement une ou plusieurs antennes directives.

[0010] Selon deux modes de réalisation particuliers de l'invention, le dispositif de détection de proximité comprend un détecteur de température et / ou un détecteur d'humidité permettant de distinguer, parmi les différents obstacles aux propagations radioélectriques, une présence humaine d'un obstacle quelconque. Un objet de l'invention étant de limiter l'émission de radiations nocives pour la santé de l'utilisateur, il est très avantageux d'utiliser de tels détecteurs de proximité.

[0011] Ces détecteurs présentent en outre deux avantages supplémentaires. De type passif, ils sont inoffensifs pour l'utilisateur puisqu'ils n'émettent aucune onde radio. De plus, ils rendent inutiles les mesures de puissance d'émission et les calculs de différence préconisés par la méthode précédemment citée de calcul de la variation de puissance. Ceux-ci sont non seulement consommateurs d'énergie mais également nocifs, puisqu'ils impliquent d'émettre à une certaine puissance pour faire les mesures avant d'effectuer éventuellement un contrôle de puissance destiné à limiter l'absorption de radiations par l'utilisateur.

[0012] La description suivante, faite en regard des dessins ci-annexés, le tout donné à titre d'exemple non limitatif fera bien comprendre comment l'invention peut être réalisée.

La figure 1 est un schéma bloc d'un appareil de communications selon l'invention.

La figure 2 représente un exemple d'équipement radio mobile selon l'invention.

La figure 3 est un schéma bloc d'un mode de réalisation particulier de l'équipement représenté à la figure 2.

La figure 4 est un organigramme pour illustrer un exemple de procédé de contrôle de puissance d'émission selon l'invention.

[0013] L'exemple représenté à la figure 1 peut être intégré dans un radiotéléphone utilisant plusieurs antennes directives en émission. Il comprend un dispositif d'émission / réception 11, couplé à une pluralité d'antennes directives 12 à 15 (ayant un diagramme de rayonnement privilégiant certaines directions en émission). Chaque antenne est électriquement connectée à un dispositif de régulation de puissance 16, commandé par un organe de contrôle 17. Un tel organe peut être constitué par un microcontrôleur µC convenablement programmé, comprenant une mémoire morte programmable, une mémoire vive, une interface d'entrées / sorties munie de convertisseurs analogique / digital et digital / analogique ainsi que de tous dispositifs nécessaires à l'interface avec les différents éléments périphériques.

[0014] Un détecteur de proximité 18 relié à l'organe de contrôle 17 détecte la présence de tissus humains à proximité de l'appareil en mesurant un paramètre d'environnement, tel que la température ou le degré d'humidité, et transmet à l'organe de contrôle 17 un coefficient de proximité caractéristique de l'objet détecté. Un tel détecteur est ainsi capable de différencier un corps humain présentant un certain coefficient d'un autre corps ayant un coefficient différent. La valeur de ce coefficient est analysée par l'organe de contrôle 17 et comparée à des valeurs de consigne stockées par exemple, en mémoire morte, pour déterminer, selon leurs directions d'émission privilégiées, quelles sont les antennes directives dont la puissance d'émission doit être réduite et pour déclencher une commande appropriée du dispositif de régulation de puissance 16.

[0015] Sous la commande de l'organe de contrôle 17, le dispositif de régulation de puissance 16 sélectionne une ou plusieurs antennes et ajuste leur puissance d'émission en fonction des données fournies par le détecteur 18.

[0016] En réception, les puissances générées étant considérablement plus faibles qu'en émission, toutes les directions de radiations peuvent être utilisées sans danger pour l'utilisateur.

[0017] Selon un mode de réalisation préféré de l'invention, le détecteur de proximité 18 est un thermomètre à infrarouge de type passif, capable de mesurer la température d'un corps à une distance d'environ une vingtaine de centimètres du détecteur. Une variante consiste à utiliser un détecteur d'humidité.

[0018] De préférence, le dispositif de régulation de puissance 16 comprend un dispositif de commutation (non représenté) commandé par l'organe de contrôle 17, pour activer ou désactiver individuellement les antennes sélectionnées et supprimer radicalement la contribution des antennes désactivées dont le diagramme de rayonnement présente un lobe dans la direction d'émission à éviter.

[0019] La figure 2 est une vue en perspective d'un radiotéléphone comprenant une structure d'antenne fonctionnant en émission / réception dont le diagramme de rayonnement, schématisé par des lobes principaux, est représenté par des traits en pointillés. L'utilisation d'antennes distinctes en émission et en réception est préconisée lorsque les bandes de fréquences utilisées respectivement pour l'émission et la réception sont trop éloignées pour être compatibles avec la bande passante des antennes. En revanche, la taille de l'appareil doit être adaptée pour recevoir un grand nombre d'antennes, ce qui est actuellement le cas des équipements fonctionnant à des fréquences de l'ordre du giga hertz.

[0020] L'exemple illustré par la figure 2 comprend un boîtier 20, un clavier 21, un écran de contrôle 22, un haut-parleur / écouteur 23, un microphone 24 et une structure d'antenne comprenant quatre antennes indépendantes directives en émission, situées à l'intérieur du boîtier 20. Ces antennes sont par exemple constituées de disques en céramique formant un diagramme de rayonnement dont les lobes principaux 25, 26, 27, 28 pointent vers quatre directions orthogonales. Au lieu d'un système à plusieurs antennes indépendamment contrôlables, on peut utiliser une antenne réseau miniaturisée de type « phased-array » ajustable, comme celle décrite en détails dans le manuel « Mobile Antenna Systems Handbook », K. Fujimoto et al, Artech House, Inc., 1994, pages 436-451.

[0021] La figure 3 est un schéma bloc illustrant le fonctionnement du radiotéléphone représenté à la figure 2. Les antennes 30 à 33 sont couplées d'une part, à des circuits d'émission / réception, Tx / Rx, au moyen d'un duplexeur, et d'autre part à des commutateurs 34 à 37, commandés par un organe de contrôle µC en fonction des informations qu'il reçoit d'un détecteur de proximité. Les circuits d'émission / réception, connus de l'homme du métier ne seront pas décrits ici. On rappelle simplement qu'un circuit d'émission couplé à une structure d'antenne comporte au moins un amplificateur de puissance. Dans le cas d'une pluralité d'antennes d'émission, le radiotéléphone doit comporter autant d'amplificateurs de puissance et de circuits d'émission que d'antennes dont la puissance d'émission doit être contrôlée indépendamment de celle émise par les autres antennes.

[0022] Selon un mode de réalisation préféré de l'invention, la détection par le détecteur de proximité 39, d'un tissu humain, déclenche la commande, par l'organe de contrôle µC, des commutateurs appropriés

pour désactiver les antennes dont le diagramme de rayonnement pointe vers la tête de l'utilisateur. Dans l'exemple à quatre antennes représenté à la figure 2, l'antenne générant le lobe 27 devra en général être désactivée.

[0023] Pour un usage dans un milieu de propagation favorisant les trajets multiples et / ou dans une région où la densité du réseau de stations de base est élevé, la suppression des antennes d'émission présentant leur lobe principal dans un hémisphère donné ne réduit pas de façon considérable la visibilité des stations de base situées dans cet hémisphère. En effet, dans le premier cas, les réflexions multiples des ondes augmentent leur probabilité d'atteindre leur cible et dans le deuxième cas, la communication peut être établie avec une autre station de base disponible. C'est pourquoi ce mode de réalisation convient particulièrement à une utilisation courante en milieu urbain. En revanche, pour toute autre utilisation, l'ajout d'une antenne omnidirectionnelle peut s'avérer utile pour éviter, le cas échéant, de perdre le contact avec la seule station de base disponible.

[0024] Selon un autre mode de réalisation, chaque antenne est reliée à un circuit d'émission propre et les commutateurs sont remplacés par des atténuateurs commandés par l'organe de contrôle pour ajuster la puissance d'émission de chaque antenne en fonction du résultat de la détection de proximité. Ce mode de réalisation exige que chaque antenne soit reliée à un amplificateur de puissance ajustable. Les amplificateurs consommant beaucoup d'énergie, ce mode de réalisation est réservé aux équipements dont la consommation n'est pas critique, comme par exemple des stations de base d'un système de télécommunications mobile.

[0025] La figure 4 illustre un procédé de contrôle de puissance d'émission pouvant être réalisé par l'organe de contrôle 17 représenté à la figure 1, et intégré dans le radiotéléphone de la figure 2 pour contrôler la puissance émise par une structure d'antennes directives.

[0026] Le procédé débute à la case K0. A la case K1, on effectue une lecture de la puissance P_{EM} émise par le radiotéléphone. Cette puissance peut être lue, par exemple, à la sortie de l'amplificateur de puissance du circuit d'émission. A la case K2, la valeur lue P_{EM} est testée et comparée à une valeur de consigne P_{MAX} représentant la puissance de radiation maximale considérée comme inoffensive pour l'utilisateur. Si le résultat du test $P_{EM} > P_{MAX}$ est négatif, le procédé se poursuit à la case K3 où toutes les antennes sont sélectionnées sans régulation de puissance. Si le résultat du test est positif, le procédé se poursuit à la case K4 avec une étape de mesure d'un paramètre d'environnement pour détecter une présence humaine à proximité de l'appareil. Selon le mode de réalisation préféré, cette étape consiste à mesurer la température ambiante T_B à l'aide d'un capteur à infrarouge sensible à une distance d'une vingtaine de centimètres environ. Le test effectué à la case K5 constitue une étape de comparaison entre la mesure T_B effectuée à l'étape précédente et des valeurs de consigne T_{MIN} et T_{MAX}. Si l'équation $T_{MIN} < T_B < T_{MAX}$ est vérifiée, on passe à l'étape K6 pour sélectionner les antennes convenables et réguler leurs puissance d'émission. Sinon, on retourne à la case K3.

[0027] On a ainsi décrit et illustré à l'aide d'exemples un appareil de communications, un équipement téléphonique, une station de base ainsi qu'un procédé de contrôle de puissance pour modifier le diagramme de rayonnement d'une structure d'antenne en fonction d'un paramètre d'environnement. Bien entendu, des variantes de réalisation pourront être apportées sans sortir du cadre de l'invention, notamment en ce qui concerne le choix du paramètre d'environnement à détecter et de la structure d'antenne utilisée.

Revendications

1. Appareil de communication de signaux radioélectriques comportant :
   - des moyens d'émission / réception couplés à une structure d'antenne présentant un diagramme de rayonnement privilégiant certaines directions en émission et
   - un dispositif de régulation de puissance commandé par un organe de contrôle pour modifier ledit diagramme de rayonnement,

   caractérisé en ce qu'il comprend un dispositif de détection de proximité pour mesurer au moins un paramètre d'environnement et fournir à l'organe de contrôle une indication de proximité pour commander le dispositif de régulation de puissance.

2. Appareil selon la revendication 1, caractérisé en ce que la structure d'antenne comprend une pluralité d'antennes directives ayant chacune, une puissance d'émission dans une direction donnée et en ce que le dispositif de régulation de puissance comporte des moyens de contrôle de puissance pour réguler la puissance d'émission des antennes directives.

3. Appareil selon la revendication 2, caractérisé en ce que les moyens de contrôle de puissance comprennent des moyens de commutation pour activer / désactiver sélectivement une ou plusieurs antennes directives.

4. Appareil selon la revendication 1, caractérisé en ce que le dispositif de détection de proximité comprend un détecteur de température.

5. Appareil selon la revendication 1, caractérisé en ce que le dispositif de détection de proximité comprend un détecteur d'humidité.

6. Equipement radio mobile susceptible de communiquer avec au moins une station radio de base d'un système de télécommunications radioélectriques, ledit équipement comportant:

- des moyens d'émission / réception de signaux radioélectriques couplés à une structure d'antenne présentant un diagramme de rayonnement privilégiant certaines directions en émission et
- un dispositif de régulation de puissance commandé par un organe de contrôle pour modifier ledit diagramme de rayonnement,

caractérisé en ce qu'il comprend un dispositif de détection de proximité pour mesurer au moins un paramètre d'environnement et fournir à l'organe de contrôle une indication de proximité pour commander le dispositif de régulation de puissance.

7. Station radio de base d'un système de télécommunications radioélectriques susceptible de communiquer avec au moins un terminal radio mobile, ladite station comportant :

- des moyens d'émission / réception de signaux radioélectriques couplés à une structure d'antenne présentant un diagramme de rayonnement privilégiant certaines directions en émission et
- un dispositif de régulation de puissance commandé par un organe de contrôle pour modifier ledit diagramme de rayonnement

caractérisée en ce qu'elle comprend un dispositif de détection de proximité pour mesurer au moins un paramètre d'environnement et fournir à l'organe de contrôle une indication de proximité pour commander le dispositif de régulation de puissance.

8. Procédé de contrôle de puissance pour contrôler la puissance rayonnée dans une direction donnée par une pluralité d'antennes directives ayant des puissances d'émission respectives,
caractérisé en ce qu'il comprend les étapes suivantes:

- une étape de mesure d'au moins un paramètre d'environnement pour détecter une présence humaine à proximité de l'appareil,
- une étape de comparaison à des valeurs de consigne,
- une étape de sélection d'au moins une antenne directive pour réguler sa puissance d'émission en fonction du résultat de l'étape de comparaison.

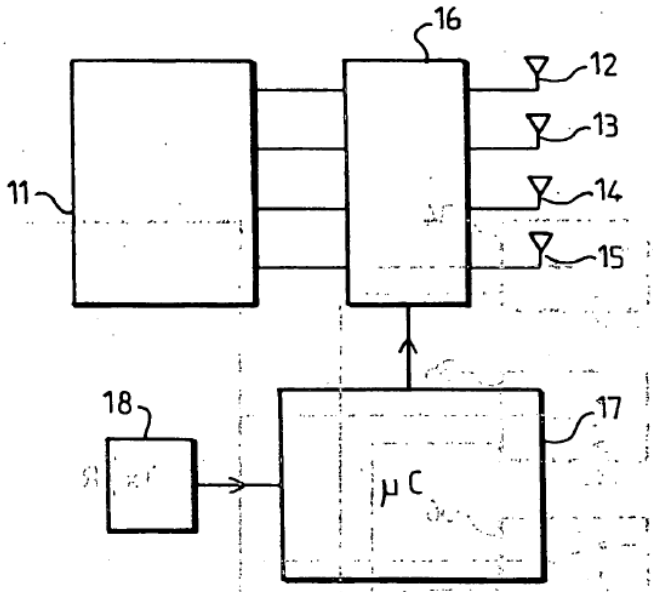

FIG.1

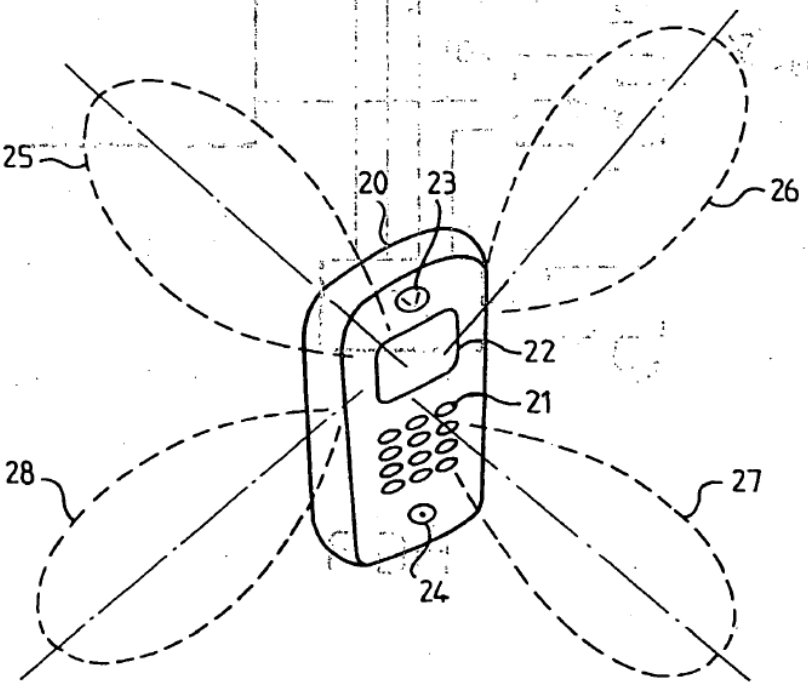

FIG.2

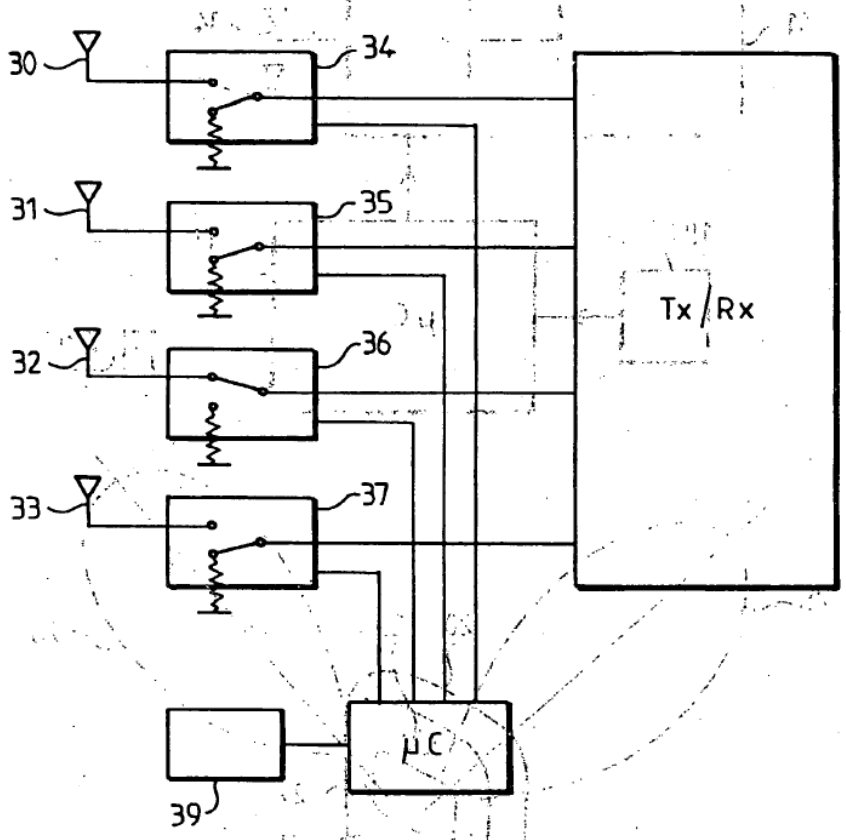

FIG.3

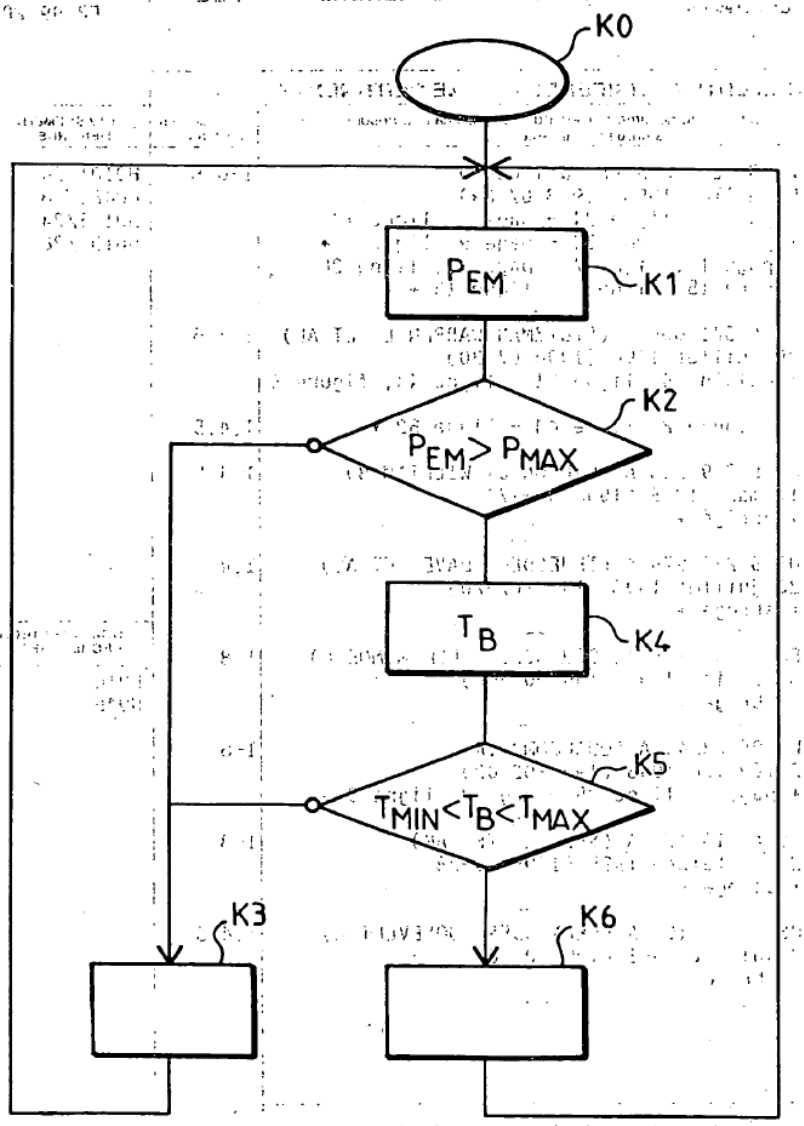

FIG.4

Office européen des brevets

RAPPORT DE RECHERCHE EUROPEENNE

Numéro de la demande
EP 99 20 2385

DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernée	CLASSEMENT DE LA DEMANDE
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Le présent rapport a été établi pour toutes les revendications

Lieu de la recherche	Date d'achèvement de la recherche	Examinateur
LA HAYE	16 septembre 1999	Wattiaux, V

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RAPPORT DE RECHERCHE EUROPEENNE

Numéro de la demande
EP 99 20 2385

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Lieu de la recherche	Date d'achèvement de la recherche	Examinateur
LA HAYE	16 septembre 1999	Wattiaux, V

CATEGORIE DES DOCUMENTS CITES

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Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office européen des brevets.

16-09-1999

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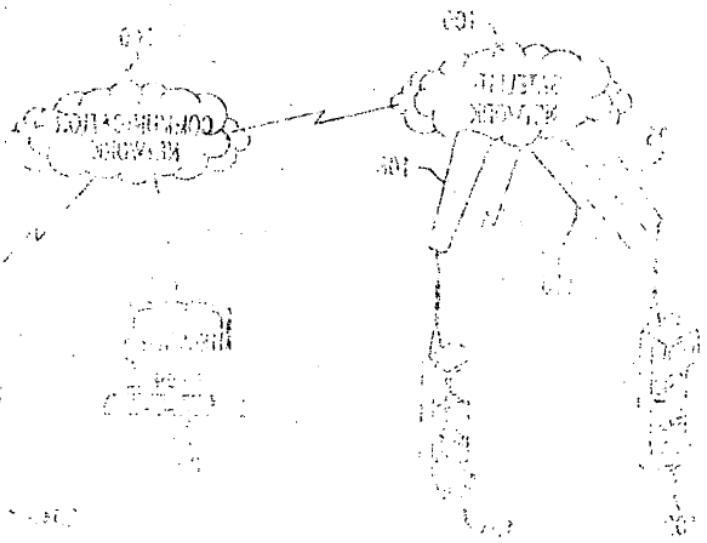

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European Patent Office
Office européen des brevets

(11) EP 0 843 421 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
10.05.2000 Bulletin 2000/19

(43) Date of publication A2:
20.05.1998 Bulletin 1998/21

(21) Application number: **97660122.9**

(22) Date of filing: **12.11.1997**

(51) Int Cl.[7]: **H04B 7/005**, H04Q 7/32

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **13.11.1996 FI 964548**

(71) Applicant: **NOKIA MOBILE PHONES LTD.**
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(72) Inventors:
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(54) A system for limiting the transmitted power of a mobile communications means

(57) The aim of the invention is to restrict the maximum transmitted power used by a mobile communication means. In most countries there are regulations in force which impose certain maximum limits on the power of electromagnetic radiation directed towards humans. These limits vary from country to country and will most probably be tightened in the future. In the system according to the invention, the upper limit of transmitted power is varied according to the mode of usage of the mobile communication means. A mobile communication means according to such a system meets the requirements made on a device operating close to the user's head, but the same mobile communication means may still be used in applications demanding greater transmitted power in a situation where the power limits placed on the radio set are less strict.

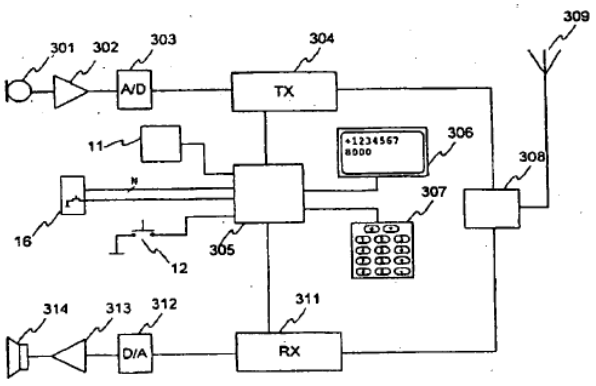

Fig. 3

EP 0 843 421 A3

Printed by Jouve, 75001 PARIS (FR)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 66 0122

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H04B
H04M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 March 2000	Dionisi, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 97 66 0122

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

(19) Europäisches Patentamt
European Patent Office
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(11) EP 0 843 421 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.05.1998 Bulletin 1998/21

(51) Int Cl.[6]: **H04B 7/005**, H04Q 7/32

(21) Application number: **97660122.9**

(22) Date of filing: **12.11.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
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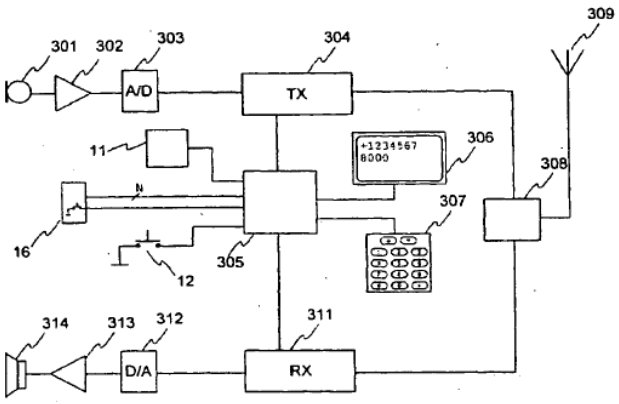

Fig. 3

EP 0 843 421 A2

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Description

FIELD OF THE INVENTION

This invention is aimed at limiting the maximum transmitted power used by a mobile communication means.

BACKGROUND OF THE INVENTION

In most countries there are regulations in force which place certain maximum limits on the power of electromagnetic radiation directed towards humans. These limits vary from country to country and will most probably be tightened in the future.

On the other hand, as the transmission speed in mobile communication means systems increases, the amount of energy radiated by mobile communication means also increases. For example, in networks based upon TDMA technology, data transmission speeds may in principle be increased by using several successive time slots in the same TDMA frame, in which case the mean transmitted power increases. The use of several successive time slots in the same frame is possible in the Universal Mobile Telecommunication System (UMTS) under development and in new Global System for Mobile communications (GSM) standards which are under development. In CMDA systems the transmitted power has to be raised in line with the data transmission speed if one wishes to keep the bit error rate constant. In both basic techniques the amount of energy radiated by the antenna increases as the data transmission speed increases, in which case the permitted limits may at some stage be exceeded.

The radiation power caused by a particular radio set and directed towards the user is typically measured on the basis of the least favourable operating situation, in the case of a cordless telephone with the antenna almost pressed against the user's head. If a radio set may be used in many ways demanding differing transmitted power, for example for voice transmission and for high-speed data transfer, all functions of the radio set have to adjust to the limits which follow from the least favourable operating situation.

For example, in the current GSM system, the maximum power of a mobile communication means which is used during one time slot is 2 W, which means that the mean transmitted power is approximately 250 mW. According to new GSM standards which are being developed, a mobile communication means may use for the high-speed data transfer as many as all eight time slots in one frame, in which case the mean transmitted power is 2 W. This causes problems if the 250 mW which is satisfactory for voice calls has been set as the upper limit of radio power directed towards the user's head. In this situation the mobile communication means may not use maximum power levels, but must use instantaneous transmitted power lower than in a voice call, so that the limit of mean transmitted power is not exceeded. This again causes audibility problems, since the base stations in the mobile communication means network are designed to cope with the needs of a voice link.

SUMMARY OF THE INVENTION

The aim of this invention is to create a system which adjusts the power level used by a mobile communication means to the mode of usage of the mobile communication means. A further aim of the invention is to create a system with the aid of which a mobile communication means may utilize the maximum permitted transmitted power in any given situation. In addition, an aim of the invention is to create a system with the aid of which the user may, if he so desires, limit the maximum values of electromagnetic radiation directed towards his body.

These aims are achieved by incorporating in the mobile communication means a device for identification of the mode of usage, and by arranging for the transmitted power of the mobile communication means to be limited according to the mode of usage and the type of current connection or connections.

Characteristic of the system according to the invention is what is described in the characteristic part of the independent claims. Dependent claims describe further advantageous embodiments of the invention. The invention is further directed to a mobile communication means, which is characterized by that which is described in the characterizing part of the corresponding independent claim.

In the system according to the invention, the upper limit of transmitted power used by the mobile communication means is varied according to the mode of usage. A mobile communication means according to such a system meets the more stringent requirements placed upon sets which are to be used next to the user's head, but the same mobile communication means may still be employed for applications demanding greater transmitted power in a situation where the power limits imposed on the radio set are less strict.

When a mobile communication means is used in a situation typical of a telephone, the mean power transmitted by the mobile communication means is limited to the maximum value for a telephone permitted by regulations and test procedures. When a mobile communication means is used for example as a data transfer device in conjunction with a portable computer, the maximum permissible transmitted power may be increased in accordance with the requirements of the data transfer rate employed.

SHORT DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail with reference to favourable embodiments, presented by way of example, and to the attached drawings, where

Figure 1 represents one possible mechanism for identification of the mode of usage of a mobile communication means, as used in the system according to the invention,

Figure 2 represents a second possible mechanism for identification of the mode of usage of a mobile communication means, as used in the system according to the invention, and

Figure 3 illustrates an advantageous embodiment of the invention.

In the drawings, the same reference numbers and symbols are used for parts which correspond to each other.

DETAILED DESCRIPTION OF THE PREFERRED INVENTION

In the system according to the invention, the transmitted power of a mobile communication means is limited according to its operating situation. When the mobile communication means is used as a cordless telephone next to the user's head, the system restricts the transmitted power of the mobile communication means to the limits demanded by this situation. When the user connects the mobile communication means to a portable microcomputer, for the purpose of data transfer for example, the system permits the use of transmitted power greater than in the preceding situation, in which case the mobile communication means may use transmission speeds higher than the transmission speed required for a talking connection, without impairment of the quality of the link. A mobile communication means equipped with such a system is capable of adhering to differing transmitted power limits according to different operating situations, with the possibility however of using the high transmitted power required by high transmission speeds when it is both necessary and possible.

In the system according to this invention, several different methods may be employed for identification of the mode of usage of the mobile communication means, depending upon the design of the mobile communication means to which the invention is applied.

Some mobile communication means are openable, so that, when the mobile communication means is closed, the communication means acts as a cordless telephone, and when it is open the communication means acts, for example, as a portable computer and multi-purpose communication means, which may be used for data transfer in many ways employing known technology. An example of this which may be mentioned is the GSM multi-purpose communication means, as presented, for example, on pages 57-58 of issue 31, 1996, of Mobile Communications International. Figure 1 contains a particular solution according to the invention as applied to such a mobile communication means. On different sides of a hinge 4 for connection of two openable parts 2, 3 of a mobile communication means are situated a switch 12 in a recess and a pin 10. When the mobile communication means is closed for normal telephone operation, the pin 10 presses against the switch 12. When the user opens the mobile communication means, the pin 10 releases the switch 12, so that the system according to the invention receives information concerning a change of mode of usage of the mobile communication means.

The structure in Figure 1 is merely an example of a possible solution. Monitoring of the cover position may, in the system according to the invention, be realized in many other ways familiar to men skilled in the art.

Mobile communication means are frequently used connected to a portable computer. Figure 2 shows one particular method of detection of the mode in such a configuration. In Figure 2, a portable computer 20 is connected by means of a connection cable 18 to a mobile communication means 1. At the interface 16 of the mobile communication means 1 there is a pin 10, which is pressed down by the plug 14 of the connection cable 18 when the user inserts the plug 14 into the mobile communication means. The pin 10 may for example press against a mechanical switch so that the system is notified of the change of mode. Connected to a portable computer, the mobile communication means is usually employed purely for data transfer, in which case the computer acts as a terminal, for example, with which the user links up to the computing system at his place of work. In such a situation, high transmission speeds are also an advantage. In such an application a system according to the invention permits the use of high transmitted power necessitated by the data transfer rates when the plug 14 is inserted into the connection socket 16. When the connection cable 18 is not connected to the mobile communication means 1, the system according to the invention only permits the use of transmitted power as required for a voice call.

Identification of the mode of usage may also be based upon the use of a position switch or any other conventional position sensing device, in which case the system permits the use of high transmitted power when the mobile communication means is in the horizontal plane or sufficiently close to a horizontal position, for example when it is placed on a table. The position switch is to best advantage designed to recognize in particular when that side of the mobile communication means which is greatest in surface area is horizontal. With such an arrangement it is possible to avoid incorrect mode identification, for example in a situation where the user is speaking into the mobile communication means at the same time as leaning backwards in an armchair.

In the mobile communication means there may be a special pull-out alphanumeric keyboard for the entry of text. In such a mobile communication means identification of the mode may be based upon the position of the keyboard: the system interprets the set as being in

telephone use when the keyboard is retracted within the set, and in data transfer use when the keyboard is pulled out.

In a system according to this invention, restriction of the mean transmitted power being used may be effected in a number of different ways. In time division mobile communication means systems, the mean transmitted power may be reduced by decreasing the number of time slots transmitted in one frame, in which case the data transmission speed drops. The mean transmitted power may also be reduced by decreasing the instantaneous power used during one time slot, in which case the number of time slots to be transmitted may be kept constant.

Limitation of the transmitted power may to best advantage be effected according to the operating situation. For example, if the mobile communication means is transmitting a file from its memory at a high data transfer rate using several time slots precisely when the user switches the telephone to a mode in which the set is used principally as a telephone, the method for limitation of transmitted power which is employed may be chosen on the basis of the type of data transmission connection. If the transmission connection used permits a change in the transmission speed, the system reduces the number of time slots used. If the transmission connection does not permit a change in the transmission speed, the number of time slots used must be kept constant, in which case the transmitted power used during one time slot must be reduced. In conditions of good audibility this is not a problem, but reduction of transmitted power at the margins of the area covered by the base station may cause an increase in bit error probability or interruption of the connection.

Power transmitted in CDMA systems may be reduced either by lowering the data transmission speed, in which case the quantity of energy transmitted by the mobile communication means falls, or by keeping the data transmission speed the same but reducing the transmitted power, for example by decreasing the transmitter's output stage amplification, in which case the bit error rate of the connection increases. The choice of the best procedure thus depends upon the quality of the connection in the CDMA system, upon the data transmission speed and upon the quality of the transmission connection.

Owing to the various effects of the different ways of limiting transmitted power as described above, the user may to his advantage determine in advance the type of power limiting method which the mobile communication means should use in the first place. The user may, for example, decide that the mobile communication means should in the first place reduce the number of time slots used, in which case the connection will be maintained more securely, and that the power used during one time slot should be reduced only when some other type of function is not possible.

In the system according to this invention, the maximum power limit observed by the system when the mobile communication means is used as a telephone may be set on manufacture of the mobile communication means on the basis of test measurements carried out on samples. Owing to changes in the limits set by the authorities and to the differing regulations in different countries, it is an advantage if the said power limit can be changed at a later stage either by the retailer or by the user of the mobile communication means.

The system according to the invention may furthermore restrict the modes of usage of the mobile communication means when the mobile communication means uses a high transmitted power. The system may, for example, totally prevent use of the mobile communication means as a telephone, or permit only calls made with the aid of the hands-free function. With such an arrangement it is possible to affect the user in such a way that he does not use the mobile communication means in a situation in which the mobile communication means exceeds the limits according to issued regulations.

The system according to the invention may thus restrict the function of the mobile communication means in addition to limiting of the transmitted power, by restricting the mode of usage. The system may then react to a change in mode when a high data transmission speed and a high transmitted power are in use, for example in the following three ways:

- by reducing the number of time slots used during one frame,
- if this is not possible on account of the transmission mode used, by reducing the power used during one time slot, or
- by preventing the making of a normal call, if a decrease in the transmitted power used in data transfer threatens to interrupt the transmission connection.

Fig. 3 shows a block diagram of a digital mobile communication means according to an advantageous embodiment of the invention. The mobile communication means comprises a microphone 301, keyboard 307, display 306, earpiece 314, antenna duplexer or switch 308, antenna 309 and a control unit 305, which all are typical components of conventional mobile communication means. Further, the mobile communication means contains typical transmission and receiver blocks 311, 304. Transmission block 311 comprises functionality necessary for speech and channel coding, encryption, and modulation, and the necessary RF circuitry for amplification of the signal for transmission. Receiver block 304 comprises the necessary amplifier circuits and functionality necessary for demodulating and decryption of the signal, and removing channel and speech coding. The signal produced by the microphone 301 is amplified in the amplifier stage 302 and converted to digital form in the A/D converter 304, whereafter the the signal is taken to the transmitter block 304. The transmitter block

encodes the digital signal and produces the modulated and amplified kF-signal, whereafter the RF signal is taken to the antenna 309 via the duplexer or switch 308. The receiver block 311 demodulates the received signal and removes the encryption and channel coding. The resulting speech signal is converted to analog form in the D/A converter 312, the output signal of which is amplified in the amplifier stage 313, whereafter the amplified signal is taken to the earpiece 314. The control unit 305 controls the functions of the mobile communication means, reads the commands given by the user via the keypad 307 and displays messages to the user via the display 307. Further, the control unit communicates with external devices via the connection socket 16 and monitors the state of the switch inside the communication socket 16 as well as other switches 12 indicating the mode of usage of the communication means. The control unit may also monitor the output signal of a position sensing device 11. The control unit then controls the transmitting power of the communication means and/or allows and/or restricts the mode of usage of the communication means in the ways described previously. When performing such control, the control unit may take also into account the types of the connections active at that time. For example, if one of the connections is for communication of speech and the mobile communication means is not in a hands-free mode, the control unit may limit the transmitting power. As a further example, if the mobile communication means is in a hands-free mode, the control unit may allow any necessary transmission mode and power to be used, since the user will most likely not have the mobile communication means close to his/her body in such a situation.

The present invention is not limited to the embodiment of Fig. 3, which is presented as an example only. For example, the invention can as well be applied to an analog communication means.

With the aid of the system according to the invention the mobile communication means user may limit the amount of radiation directed towards his body.

A mobile communication means utilizing the system according to the invention may be employed both as a cordless telephone and as a high-speed data transfer device and in both operating situations it may use the maximum mean transmitted power permitted in the operating situation in question.

The invention has been explained above with reference to certain favourable applications thereof, but it is clear that the invention may be varied in many different ways within the framework of the innovative concept defined in the attached Patent Claims.

Claims

1. A system for limiting the transmitted power of a mobile communication means capable of having at least one connection having a connection type, **characterized** in that it comprises
   - at least one means for producing an indication of the mode of usage of the mobile communication means,
   - a control unit for controlling the functions of the mobile communication means and for controlling the transmitting power of the mobile communication means as a response to said means for identification and the connection type of the at least one connection.

2. A system according to claim 1, **characterized** in that it is arranged to limit the instantaneous transmitted power as a response to said means for identification and the connection type of the at least one connection.

3. A system according to claim 1, **characterized** in that it is arranged to limit the data transmission speed used by the mobile communication means as a response to said means for identification and the connection type of the at least one connection.

4. A system according to claim 1, **characterized** in that it is arranged to limit the number of time slots used for transmission in one frame of the time division system as a response to said means for identification and the connection type of the at least one connection.

5. A system according to claim 1, **characterized** in that it is arranged to prevent high-speed data transmission in a situation where the mobile communication means would exceed the permitted power limits on the use of high-speed data transmission as a response to said means for identification and the connection type of the at least one connection.

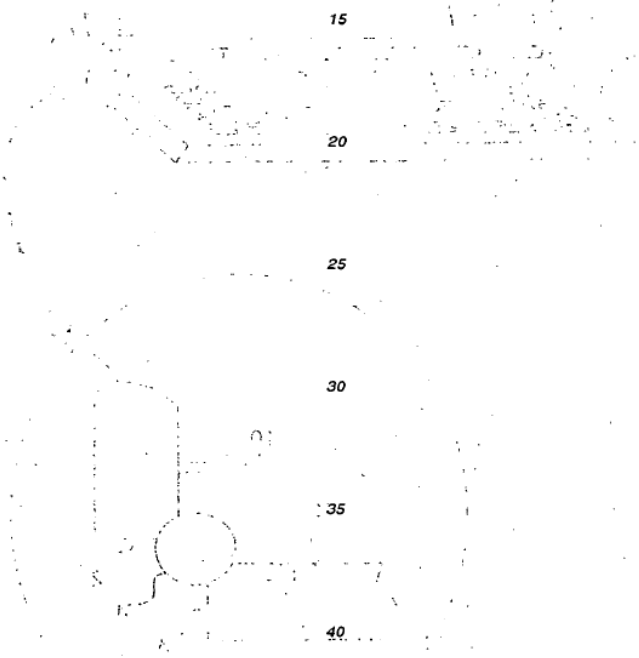
6. A system according to claim 1, **characterized** in that it comprises a connector for connecting an external cable, and in which system at least one of said at least one means for producing an indication is a switch indicating whether or not there is a cable connected to said connector.

7. A system according to claim 1, **characterized** in that it comprises a first part, a second part, and at least one hinge for rotatably attaching said first part to said second part, and in which system at least one of said at least one means for producing an indication is a means for producing an indication of the relative position of said first and second parts of the mobile communication means.

8. A system according to claim 1, **characterized** in that at least one of said at least one means for producing an indication is a position sensing device.

9. A mobile communication means capable of having at least one connection having a connection type, **characterized** in that it comprises

- at least one means for producing an indication of the mode of usage of the mobile communication means,
- a control unit for controlling the functions of the mobile communication means and for controlling the transmitting power of the mobile communication means as a response to said means for identification and the connection type of the at least one connection.



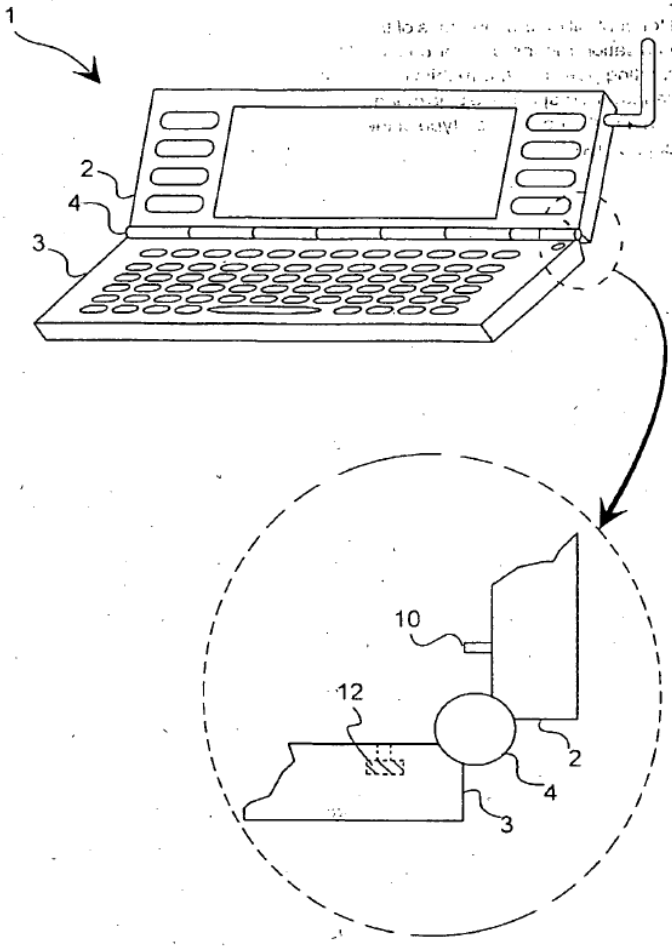


Fig. 1

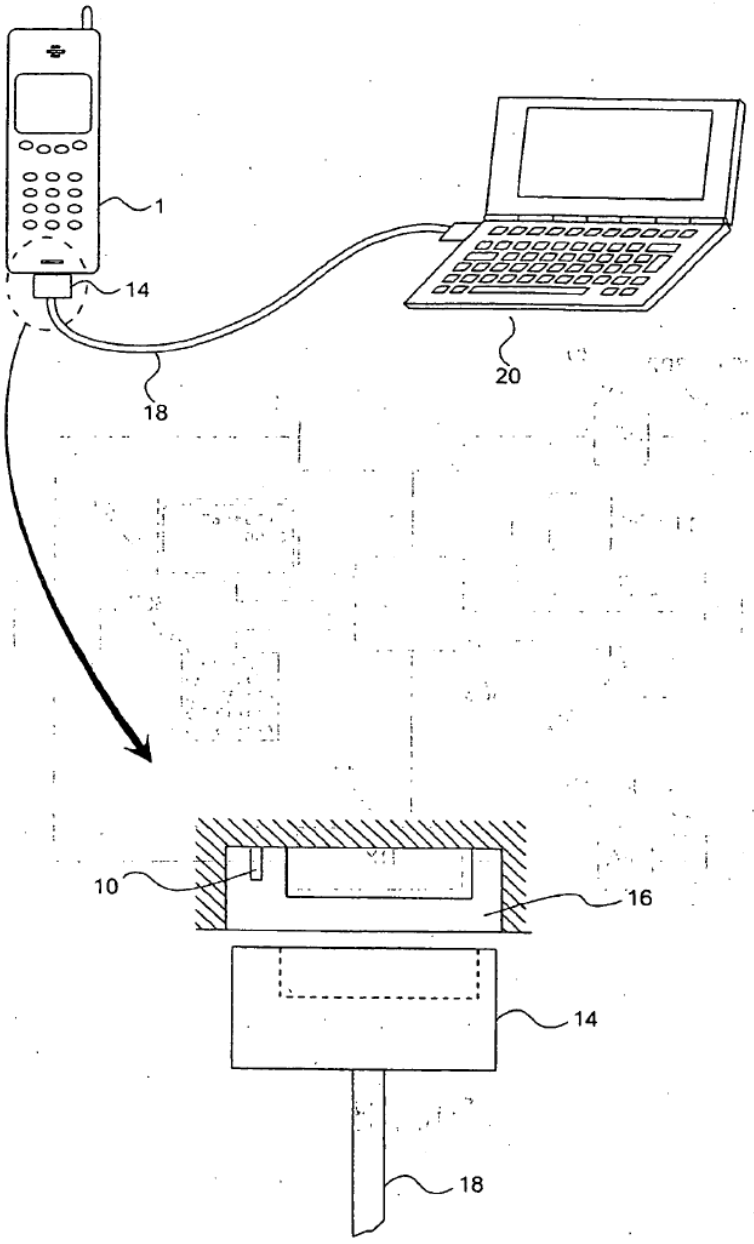


Fig. 2

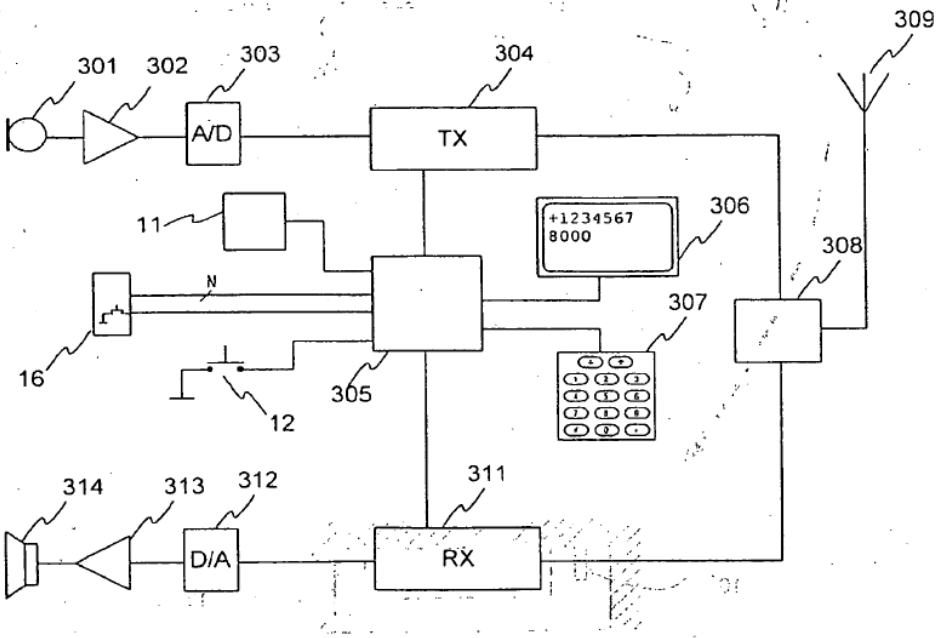


Fig. 3

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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 843 421 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
10.05.2000 Bulletin 2000/19

(43) Date of publication A2:
20.05.1998 Bulletin 1998/21

(21) Application number: **97660122.9**

(22) Date of filing: **12.11.1997**

(51) Int Cl.7: **H04B 7/005**, H04Q 7/32

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **13.11.1996 FI 964548**

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(54) A system for limiting the transmitted power of a mobile communications means

(57) The aim of the invention is to restrict the maximum transmitted power used by a mobile communication means. In most countries there are regulations in force which impose certain maximum limits on the power of electromagnetic radiation directed towards humans. These limits vary from country to country and will most probably be tightened in the future. In the system according to the invention, the upper limit of transmitted power is varied according to the mode of usage of the mobile communication means. A mobile communication means according to such a system meets the requirements made on a device operating close to the user's head, but the same mobile communication means may still be used in applications demanding greater transmitted power in a situation where the power limits placed on the radio set are less strict.

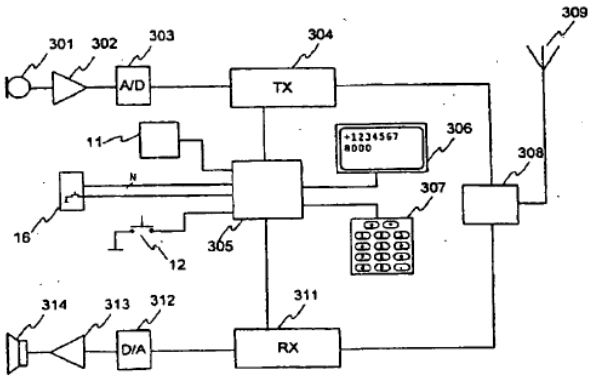

Fig. 3

EP 0 843 421 A3

Printed by Jouve, 75001 PARIS (FR)

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EUROPEAN SEARCH REPORT

Application Number
EP 97 66 0122

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 93 01659 A (MOTOROLA INC) 21 January 1993 (1993-01-21) * page 35, line 26 - page 37, line 4; figure 14 * * page 38, line 1 - line 26 *	1,9	H04B7/005 H04Q7/32
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 March 2000	Dionisi, M

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PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04B 7/26 — A2

(11) International Publication Number: **WO 98/29968**

(43) International Publication Date: 9 July 1998 (09.07.98)

(21) International Application Number: PCT/US97/24170

(22) International Filing Date: 23 December 1997 (23.12.97)

(30) Priority Data:
08/774,456 30 December 1996 (30.12.96) US

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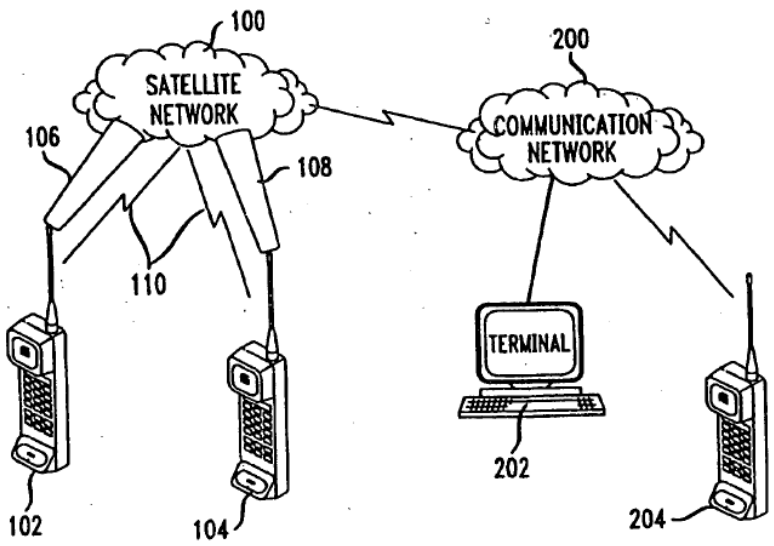
(81) Designated States: CA, JP, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: PORTABLE SATELLITE PHONE FOR COMMUNICATION WITH DIRECT LINK TO SATELLITE

(57) Abstract

A portable satellite phone is integrated into a communication system. The portable satellite phone forms a highly directed beam toward a satellite and adaptively maintains a beam to track the satellite as the portable satellite phone and/or the satellite moves relative to each other. A communication system based on the portable satellite phones may link a portable satellite phone with either another portable satellite phone or a ground based communication system connected to conventional telephone stations. The portable satellite phone includes a steering information detector or both a steering information detector and a proximity detector. The steering information detector has a bearing sensor, an attitude sensor and GPS signal receivers for position detection. The portable satellite phone also includes a database that contains the positional information of all potential communication satellites. The proximity detector detects objects that may interfere with the antenna beam. The proximity detector includes infrared sensors, sonar detectors, motion detectors and optical devices to determine a range and bearing of objects that may interfere with the antenna beam. When an object may be harmed or interfere with the antenna beam, an alarm may be activated to warn the user and/or the object of potential harm from the electro-magnetic energy transmitted by the directed antenna.



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PORTABLE SATELLITE PHONE FOR COMMUNICATION WITH DIRECT LINK TO SATELLITE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to communications using a satellite network.

2. Background of the Invention

Currently, mobile communication terminals such as cellular phones wirelessly communicate with base stations which in turn may connect a call to geographically distant locations through satellites. However, when cellular phones are too distant from a base station, a communication path cannot be completed between the cellular phone and the base station leaving a caller undesirably stranded without ability to communicate.

Conventional cellular phones cannot communicate directly with satellites when too distant from the base stations partially because the power required to reach a satellite is beyond the capability of a cellular phone. In addition, if sufficient power is available, the electromagnetic energy output from the cellular phone antenna may be harmful to the user of the cellular phone as well as to others who are in close proximity to the cellular phone.

SUMMARY OF THE INVENTION

This invention provides a portable satellite phone that communicates with satellites directly. The portable satellite phone may form a highly directed beam toward a satellite and adaptively maintains a beam to track the satellite as the portable satellite phone and/or the satellite moves relative to each other.

An exemplary embodiment of a communication system may link a portable satellite phone with either another portable satellite phone or a ground based communication system connected to conventional telephone stations. When a user of a portable satellite phone dials a number

corresponding to another portable satellite phone, the satellites of a satellite network identifies a destination satellite that can reach the called party's portable satellite phone.

The called party's portable satellite phone remains in a standby mode and receives an alert signal from the destination satellite indicating that a call is pending. The called party's portable satellite phone alerts the called party and if the called party answers the call, the called party's portable satellite phone directs an antenna beam toward the destination satellite to complete the communication path between the calling and called parties.

The portable satellite phone forms a directed antenna beam toward a satellite by determining the positions of the satellite and a position/bearing/attitude of the portable satellite phone. The portable satellite phone includes a steering information detector that may include a gyrocompass, a plumb line, an attitude sensor and Global Positioning System (GPS) signal receiver. The portable satellite phone also includes a database that contains information of the positions of all potential communication satellites and a schedule of appearance within a range of the portable satellite phone. An antenna controller receives information from the steering information detector and the information from the database to determine the direction of the directed antenna beam.

The portable satellite phone also includes a proximity detector that detects objects that may interfere with an antenna beam formed by the portable satellite phone. The proximity detector may include infrared sensors, sonar detectors, motion detectors and optical devices to determine range and bearing of objects that may interfere with the antenna beam. If an object is detected within a predetermined distance of the antenna beam, the antenna controller may alternatively reshape the

antenna beam to avoid the object, redirect the antenna beam to a different satellite to avoid the object, or reduce the power output of the antenna beam to prevent harming the object. Also, the antenna controller may activate an alarm to warn the user of the portable satellite phone and/or the object of the potential interference of the antenna beam and possible harm from the electro-magnetic energy transmitted by the directed antenna.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in detail with reference to the following drawings, wherein like numerals represent like elements and wherein:

Fig. 1 is a diagram of a communication system using direct satellite links;

Fig. 2 is a diagram of a portable satellite phone communicating via satellite with a ground based communication system;

Fig. 3 is a diagram of a portable satellite phone communicating with another portable satellite phone;

Figs. 4A-4D show a fan beam and the fan beam cross-sections;

Fig. 5 is a diagram showing possible communication satellites;

Fig. 6 is a block diagram of a portable satellite phone unit;

Fig. 7 is a block diagram of a steering information detector;

Fig. 8A shows a diagram of a portable satellite phone having a folded planar phased array directional antenna;

Fig. 8B shows a folded planar antenna phased array that may be used in the portable satellite phone of Fig. 8A; Fig. 8C shows a relationship of a shield to the folded planar antenna phased array of Fig. 8B;

Fig. 9A shows a portable satellite phone having a volumetric phase array directional antenna;

Fig. 9B shows a cylindrical volumetric phased array antenna that may be used with the portable satellite phone shown in Fig. 9A;

Fig. 10 shows a diagram of a portable satellite phone having a hat phased array antenna;

Fig. 11 is a block diagram of sensors for a proximity detector;

Fig. 12 is a block diagram of an alarm device;

Fig. 13 is a block diagram of an antenna controller of the portable satellite phone shown in Fig. 5;

Fig. 14 shows a flowchart for a communication process using portable satellite phones;

Fig. 15 shows a portable satellite phone changing communication paths between two satellites by snapping the antenna beam from one satellite to another satellite;

Fig. 16 shows a portable satellite phone changing communication paths from one satellite to another satellite by forming a bridging beam;

Fig. 17 shows a process of the portable satellite phone forming and adaptively maintaining an antenna beam directed at a satellite;

Fig. 18 shows a portable satellite phone process for responding to objects that interfere with a beam path of the portable satellite phone; and

Fig. 19 is a diagram of a communication system that includes phased array antennas that are mounted on fixed structures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a communication system that includes portable satellite phones 102 and 104 communicating with a satellite network 100. The portable satellite phones 102 and 104 form antenna beams 106 and 108 that are directed toward satellites of the satellite

network 100. The portable satellite phones 102 and 104 receive Global Positioning System (GPS) signals 110 through GPS receivers included in the portable satellite phones 102 and 104. Satellites of the satellite network 100 may communicate with calling and called parties directly through the portable satellite phones or through a ground based communication network 200 to complete a communication path. Whether a called party is reached through either the portable satellite phone 102 or 104 or the ground based communication network 200 is determined by known methods such as specially assigned numbers. If a conventional telephone number is used, the ground based communication network 200 may connect to terminal 202 (which may be a telephone station or other devices such as a facsimile device) or to mobile units 204 such as cellular phones to reach the called party.

When a calling party uses the portable satellite phone 102 and calls a called party by dialing a conventional telephone number, the portable satellite phone 102 selects a satellite of the satellite network 100 and forms an antenna beam directed to the selected satellite, as shown in Fig. 2. The selected satellite either directly or through other satellites of the satellite network 100 links to the ground based communication network 200 by well known methods and completes the communication path between the portable satellite phone 102 and a telephone station such as terminal 202 of the called party that is coupled to the ground based communication network 200.

When the calling party dials a number assigned to the portable satellite phone 104, for example, the portable satellite phone 104 is alerted of the call by a destination satellite of the satellite network 100, as shown in Fig. 3. The destination satellite and the selected satellite may be the same satellite if the portable satellite phone 104 is reachable by the selected

satellite. Otherwise, the selected satellite must link to the destination satellite (perhaps through yet other satellites) to complete the communication path to the called party's portable satellite phone 104. Normally, the portable satellite phone 104 is placed in a standby mode and may receive alert signals from satellites serving the geographical area where the portable satellite phone 104 is located. When the portable satellite phone 104 detects an alert signal from the destination satellite, the portable satellite phone 104 alerts the called party that an incoming call is received. When the called party activates the portable satellite phone 104 by turning it on, the portable satellite phone 104 forms an antenna beam directed at the destination satellite and establishes a connection to complete the call.

The portable satellite phones 102 and 104 communicate with satellites directly by forming highly directed antenna beams directed at a specific satellite. In this way, the amount of power required to communicate with a satellite is reduced. In addition, because the electromagnetic energy is concentrated in a narrow antenna beam, the area affected by the electromagnetic energy is reduced, thus reducing the possibility of harmful effects to persons that may be in the neighborhood of the portable satellite phone.

The portable satellite phones 102 and 104 must accurately determine their individual position/bearing-attitude and the position of the selected or destination satellite to form the antenna beam. The portable satellite phones 102 and 104 determine their own positions (latitude and longitude) by sensing GPS signals 110 transmitted by either GPS satellites or satellites of the satellite network 100.

The portable satellite phones 102 and 104 include a database of satellite positions and a schedule of when a specific satellite may be within the range of the portable

satellite phones 102 and 104. The portable satellite phones 102 and 104 include clocks so that accurate satellite positions may be determined at any time. Thus, the portable satellite phones 102 and 104 may be able to determine the positions of possible satellites that can provide the desired communications links. Also, alternatively, satellites may transmit a tracking signal or specific position information to assist the portable satellite phones 102 and 104 to locate a satellite's exact position.

In addition to their position, the portable satellite phones 102 and 104 determine a bearing (direction such as North, South, East or West) and attitude (direction relative to vertical) of the portable satellite phones 102 and 104. Based on the positions/bearings/attitudes of the portable satellite phones 102 and 104 and the positions of the satellites, the portable satellite phones 102 and 104 determine the exact relative position between the portable satellite phones 102 and 104 and the selected/destination satellite so that an antenna beam may be formed directed at the desired satellite.

For less expensive versions of the portable satellite phones 102 and 104, bearing and attitude detection could be omitted. For these simpler portable satellite phones 102 and 104, the portable satellite phones 102 and 104 must be positioned so that an antenna beam may be directed to a satellite for communication. In particular, the portable satellite phones 102 and 104 may be maintained in an erect or vertical position and need be orientated approximately in a proper bearing to allow the portable satellite phones 102 and 104 to form an antenna beam toward a satellite, for example.

For this simple case, based on the geographical position of the portable satellite phones 102 and 104 determined from the GPS position coordinates, the portable

satellite phones 102 and 104 may indicate to the user which bearing to orientate the portable satellite phones 102 and 104. For example, the portable satellite phones 102 and 104 may have four LEDs to indicate North, South, East and West or even finer even more precise indications.

For the above lower cost embodiment, the portable satellite phones 102 and 104 may form a fan beam 120 having generally rectangular or elliptical cross-sections, as shown in Figs. 4A-4D using portable satellite phone 102 as an example. The fan beam is directed at an elevation angle determined by the GPS coordinates of the portable satellite phones 102 and 104 and the satellite position and has a fan angle that provides a large relative bearing range between the satellite and the portable satellite phones 102 and 104. The fan angle may be any value limited only by the user's body (head) so that physical harm from exposure to the fan beam is avoided. A fan angle range of about 60 to 120 degrees would be preferred. Thus, the fan beam 120 permits the portable satellite phones 102 and 104 to communicate with a satellite without depending on exact bearing and attitude information.

When the above low cost embodiment is turned on and the fan beam reaches a satellite, a dial tone is generated to indicate to the user that a communication path is established. However, if a satellite cannot be reached, a dial tone is not generated. The user may reorientate the portable satellite phones 102 and 104 in a different bearing until the communication path is established and a dial tone is generated.

The portable satellite phones 102 and 104 are provided with proximity detectors. When an object, such as a person, comes within a predetermined distance of the antenna beam and/or the portable satellite phones 102 and 104, the portable satellite phones 102 and 104 may either reshape or redirect the antenna beam to avoid the object

or reduce the transmitted power of the antenna beam to avoid causing harm to the object.

In addition, the portable satellite phones 102 and 104 may also activate an alarm to warn the object or the user of the portable satellite phones 102 and 104 to avoid the antenna beam. When a user of the portable satellite phone 102, for example, moves the portable satellite phone 102 in an orientation where the antenna beam is blocked by the user or objects that cannot be moved, the portable satellite phone 102 may use the alarm to request the user to reorientate the portable satellite phone 102 so that an antenna beam may be properly directed away from the interfering object and toward the desired satellite.

Figure 5 shows possible communication satellites that may be a part of the satellite network 100. A geostationary earth orbit (GEO) satellite 304 is a satellite that is placed in an orbit so that the satellite maintains a fixed position relative to the surface of the earth 300. A medium altitude earth orbit (MEO) and low altitude earth orbit (LEO) satellites 306 and 308 are satellites that may be in motion relative to the surface of the earth. These satellites are closer to the surface of the earth 300 as compared to the GEO satellite 304. Because of the shorter distance to the surface of the earth 300, less power is required to establish communication using the MEO and LEO's, however, the portable satellite phones 102 and 104 must account for the changing positions of the satellites and occasionally transition from a first satellite to a second satellite when the first satellite position moves out of range of the portable satellite phones 102 and 104.

A highly elliptical orbit (HEO) satellite 310 forms an elliptical orbit around the earth 300 as compared to the approximately circular orbit formed by the other satellites. A GEO-helio synchronous orbit (BradCo) satellite 311 is positioned in an orbit around the sun 302

and maintains a fixed position relative to the earth 300. An intermediate circular orbit (ICO) satellite 312 is positioned in a circular orbit around the earth 300 at an altitude in between the MEO and LEO 306 and 308 and the GEO 304 satellites. All of the above satellites 304-314 may be utilized to form the satellite network 100.

Figure 6 shows a block diagram of the portable satellite phone 102. The portable satellite phone 102 includes an antenna controller 400 connected to a directional antenna 402. A steering information detector 404, a proximity detector 406, an alarm device 408 and other portable satellite phone elements 410 are all coupled to the antenna controller 400.

When the antenna controller 400 receives an instruction from the other portable satellite phone elements 410 to establish communication with the satellite network 100, the antenna controller 400 selects a satellite of the satellite network 100 and determines a position of the satellite by consulting the database contained in the portable satellite phone 102. The antenna controller 400 may also select a satellite by scanning for available satellites within reachable range. A set of preassigned communication channels may be assigned for satellites to broadcast their positions and availability information. Satellites newly added to the satellite network may use these channels to announce their availability especially to portable satellite phones 102 having older databases. The antenna controller 400 also determines the position/bearing/attitude of the portable satellite phone 102 via the steering information detector 404. Based on the position of the selected satellite and the position/bearing/attitude of the portable satellite phone 102, the antenna controller forms an antenna beam that is directed toward the selected satellite using the directional antenna 402 to establish a communication path to the selected satellite.

During call setup and after the communication path with the selected satellite is established, the antenna controller monitors for beam blockage by objects such as a person using the proximity detector 406. When the proximity detector 406 detects a person within a predetermined distance from the communication path, the antenna controller 400 may take one of several alternative actions to avoid harming the person that may be caused by the electromagnetic energy transmitted by the directional antenna 402.

The antenna controller 400 may reduce the power level transmitted by the directional antenna 402 to avoid harming the person. If the power level is reduced below a level required for communication with the selected satellite, the antenna controller 400 alerts the user of the portable satellite phone 102 through the alarm device 408. The antenna controller 400 may also determine whether the antenna beam may be reshaped so as to avoid harming the person or whether another satellite may be selected to avoid harming the person.

For example, a circular cross-section antenna beam pattern may be modified into an asymmetric cross-section to reduce the received power level at the person while maintaining the power density in the satellite direction. The actual antenna beam patterns necessary to satisfy these conditions will vary depending on the angular separation between the satellite and the intercepting person, as well as the person's distance from the phone's antenna.

Figure 7 is a block diagram of the position detector 404. The steering information detector 404 includes an attitude sensor 900, a GPS receiver 904 for receiving GPS signals and a gyrocompass 906. The above components are coupled together via a signal bus 908. The attitude sensor 900 determines the portable satellite phone 102's orientation relative to vertical or "plum

line". The GPS receiver 904 receives GPS signals generated by the Global Positioning System indicating the position of the portable satellite phone 102. The gyrocompass 906 determines the azimuth and bearing of the portable satellite phone 102. The steering information detector 404 is coupled to the antenna controller 400 through the signal bus 908.

The directional antenna 402 may be any electronically steerable antenna. A class of phased array antennas is preferred. In general, a phased array of independent antenna elements may be configured in a linear, planar or volumetric array. Such an antenna may be electronically directed or steered by controlling the amplitude and phase of signals applied to each of the antenna elements. For example, an antenna beam of a planar array of uniformly spaced antenna elements can be steered in angular space by applying a signal to each of the antenna elements having a fixed time shift relative to the antenna elements. The shape of the antenna beam may be controlled by applying signals to each of the antenna elements having varying amplitudes relative to the other antenna elements. The amplitude of the signals applied to each antenna element may be weighted by multiplying by a respective weight value. An antenna beam pattern may be broadened or elongated by reducing or eliminating (weight equals 0) elements along an axis of the planar array.

Figure 8A shows a folded planar phased array antenna 602 disposed on the back and top sides 604 and 606 of a portable satellite phone 600. Figure 8B shows the folded planar phased array antenna 602 having antenna elements 608 uniformly disposed on the back side 604 and antenna elements 610 uniformly disposed on the top side 606 of the folded planar phased array antenna 602. The back and top sides 604 and 606 of the folded planar phased array antenna 602 act as a single planar array when the top antenna elements 610 are phase shifted by 90 degrees

(in the plane perpendicular to the back and top sides 604 and 606) relative to those on the back side 604. The folded planar phased array antenna 602 has slightly better directionality than a planar array.

Figure 8A shows a shield 609 that shields a user from the electromagnetic energy transmitted by the folded planer phased array antenna 602. As shown in Figure 8A, the shield 609 is disposed between the folded planar array antenna 602 and an ear piece so that the user is shielded from the electromagnetic energy especially when the antenna phone 602 is positioned next to the user's head. The shield may include any metallic material and may be electrically grounded with respect to the folded planar array antenna 602.

The antenna gain and antenna directionality are proportional to a number of elements in the phased array antenna. At Ka band frequencies of 17-30 and 40 Ghz, the wavelength approaches 1.0 cm. A conformal antenna with quarter wavelength element spacings would occupy approximately 5 x 5 cm which can accommodate a 20 x 20 element array at these frequencies. A folded planar phased array located on the top and back sides 606 and 604 of the folded phased array antenna 602 may provide 20 x 8 elements on the top side 606 (~2 x 5 cm) and 20 x 20 elements on the back side 604 (~5 x 5 cm).

Figures 9A and 9B show another embodiment of a portable satellite phone 700 having a volumetric phased array antenna 702. As shown in Fig. 9B, the phased array antenna 702 includes a cylindrical antenna body 704 having antenna elements 706 uniformly disposed on the surface of the cylindrical body 704.

Figure 10 shows an antenna phone 650 having a hat phased array antenna 652. The hat phased array antenna 652 is a volumetric phased array antenna where the space enclosed by the sides of the hat phased array antenna 652 is filled with antenna elements (not shown). The front

surface 662 is a metallic shield, for example. The shield 662 may be disposed between the antenna array elements 670 and a user's head and may be a planar metallic shield embedded in the portable satellite phone 650.

For higher end Ka band frequencies and assuming a quarter wavelength spacing, the maximum number of antenna elements 670 and 706 for volumetric antennas 652 and 702, respectively, is approximately 64 times the cubic volume (in units of cm^3) of the antennas 652 and 702. The hat phased array antenna 652 on the top of the antenna phone 650 may have with a volume of roughly (2 x 25 cm or 20 cm^3) and may have over 1000 antenna elements 670.

Antenna array selection may depend on 1) high frequency electronics required for electronic steering; 2) electromagnetic properties of the antenna; and 3) dielectric and shielding structure. Ideally the spatial diversity of a volumetric array and a largest number of antenna elements 670 and 706 is most desirable. An antenna array with the largest gain and best directionality may be the most preferred.

Figure 11 shows a block diagram of the proximity detector 406. The proximity detector 406 may include an infrared device 910, an optical device 912, a sonar device 914 and a motion detector 916. The above components are coupled via bus 918 which also couples the proximity detector to the antenna controller 400. The function of the proximity detector 406 is to determine a distance of the object from the portable satellite phone 102 along the communication path formed by the directional antenna 402 that may interrupt the communication path or be harmed by electromagnetic energy transmitted by the directional antenna 402. In addition, a distance of the object from the communication path may also be determined. These distances together with a known antenna pattern of the antenna beam formed by the directional antenna 402 may be used to reduce the transmission power of the directed

antenna 402 or adapt the antenna beam pattern to prevent physical harm to the object.

The infrared device 910 detects the presence of a human being by sensing an increase in the infrared energy relative to the background. The infrared device 910 is useful for detecting the presence of a person in a target area such as a neighborhood of the communication path formed by the antenna beam. The motion detector 916 detects the presence of an object formed by detecting a motion of the object. Similar devices common in home security systems use a plurality of infrared detectors or use sonic beam echoes to indicate the presence of a moving object.

The sonar device 914 may determine a distance and bearing of the object relative to the satellite antenna 102 and the antenna beam. The sonar device 914 may operate similarly to medical imaging devices or sonic tape-measuring devices commonly used in the building industry. A sonic pulse is emitted by the sonar device 914 and the round trip delay of the sonic pulse reflected from the object may be used to determine the distance and bearing of the object relative to the portable satellite phone 102.

The optical device 912 may also be used for determining range and bearing. Two lens systems may be provided to determine a focal distance to the object based on the parallax of the two lens systems. Optical parallax is commonly used in cameras for auto focusing. Parallax inherent in two lens systems are adjusted until the object is in focus. Since lens position is directly proportional to the distance to the object, this method may be applied to the proximity detection problem on the portable satellite phone 102 to directly measure a distance to the object. After dark, natural light may be supplemented with periodic flashes of light to periodically check for

objects and determine their distance from the antenna beam.

A preferred embodiment of the proximity detector 406 is a combination of the optical device 912 that provides accurate ranging and the sonar device 914 that may provide general detection of the presence of an object as well as distance and bearing information.

Figure 12 shows a block diagram of the alarm device 408. The alarm device includes a visual alarm device 920, an audio alarm device 922 and an external alarm interface 924. The above components are coupled to a signal bus 926 which also couples to the antenna controller 400.

The visual alarm device may include lights such as LEDs mounted on the portable satellite phone 102. The lights may be configured so that the lighting of a particular LED indicates a warning of possible physical harm while the lighting of another LED may indicate an inoperative condition. In addition, the LED may be placed on the portable satellite phone 102 to indicate to the user a suggested posture change to change the position of the portable satellite phone 102.

The audio alarm device 922 may generate audio alarm signals directly into the receiver of the portable satellite phone 102 instructing the user to either change the position of the portable satellite phone 102 or informing the user that an object is about to interfere with the antenna beam and cause a loss of communication with the satellite. The audio alarm device 922 may also include an audible alarm separate from the alarm generated in the receiver of the portable satellite phone 102. Such an audible alarm may alert a person (for example, the object) other than the user of the possible exposure to unacceptable levels of electromagnetic energy.

The alarm device 408 also includes an external alarm interface 924 that may be coupled to other alarm

devices physically separate from the portable satellite phone 102. The external alarm interface 924 may include an infrared link to other alarm devices that may either warn or physically prevent an object from entering into an area that may be physically harmful.

Figure 13 is a block diagram of the antenna controller 400. The antenna controller 400 includes a processor 500, and a memory 502. The antenna controller 410 include interfaces to other components of the portable satellite phone 102. The interfaces are as follows: steering information detector interface 504, directional antenna interface 506, proximity detector interface 508, alarm device interface 510 and interface to other portable satellite phone elements 512. All of the above components are coupled together via a signal bus 514. Each of the interface components 504-512 contain the necessary devices required to interface with each respective device. For example, the directional antenna interface 506 includes all the electronics necessary to receive and transmit signals through the directional antenna as well as the necessary components required to form antenna beams in a desired direction.

The database that contains the satellite positional information is stored in the memory 502. Other information required for controlling and interfacing with each of the components of the portable satellite phone 102 as well as programs required for the processor 500 may also be stored in the memory 502.

When an instruction to establish a communication path is received from the other portable satellite phone elements 410 through the interface to other portable satellite phone elements 512, the processor 500 responds by determining whether the user is a calling party or a called party. If the user is a calling party, the processor searches the database in the memory 502 and selects an appropriate satellite of the satellite network

100 based on criteria such as cost, satellite position, etc. If the user is a called party, the processor 500 searches the database to determine a position of the destination satellite. Alternatively, the processor 500 may also receive information from the destination satellite during a call set up process.

After a satellite position is determined, the processor 500 interfaces with the steering information detector 404 through the steering information detector interface 504 to determine the position/bearing/attitude of the portable satellite phone 102. When both the satellite position and the position/bearing/attitude of the portable satellite phone 102 are determined, the processor 500 sends appropriate control information to the directional antenna 402 through the directional antenna interface 506 to direct an antenna beam toward the selected/destination satellite.

After the communication path to the selected/destination satellite is established, the processor 500 adaptively maintains the antenna beam directed to the selected/destination satellite by monitoring the satellite position as well as the position/bearing/attitude of the portable satellite phone 102 and adjusts the direction of the antenna beam by sending appropriate parameters to the directional antenna through the directional antenna interface 506. The processor 500 may also receive positional information from the selected/destination satellite to assist the processor 500 in directing the antenna beam.

During the call setup process and for the duration of the communication with the satellite, the processor 500 activates the proximity detector 406 to determine whether there are objects, such as people, within a predetermined distance from the antenna beam. When the proximity detector detects an object, the processor 500 determines the distance and bearing of the object based on the

information received from the proximity detector 406. The processor 500 then takes alternative action such as redirecting the antenna beam, to another satellite for example, to prevent physical harm to the object, modify the antenna beam pattern to reduce a power level at the object while still communicating with the selected destination satellite, reduce the power transmitted by the directional antenna 402 and/or sending appropriate commands to the alarm device to output a warning of possible harm or loss of communication.

Figure 14 shows a process of communication using the portable satellite phone 102. In step S1000, a calling party dials a number using the portable satellite phone 102. When the calling party dials a number, the processor 500 of the portable satellite phone 102 receives an instruction from the other portable satellite phone elements 410 to establish communication with an appropriate satellite. Then the process goes to step S1002.

In step S1002, the processor 500 accesses the database stored in the memory 502 to determine which satellite of the satellite network 100 is most appropriate for the number dialed by the calling party. The satellite selection may be based on criteria such as cost, position of the satellites, and the capability of the satellite and the portable satellite phone 102 to establish a complete communication path from the portable satellite phone 102 to the called party. After the appropriate satellite is selected, the process goes to step S1004.

In step S1004, the processor 500 determines the position of the portable satellite phone 102 by accessing information from the position detector 404 through the position detector interface 504. After determining the position of the portable satellite phone 102, the processor 500 determines the proper direction of an antenna beam and sends appropriate control information to