IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF CALIFORNIA

BELL NORTHERN RESEARCH, LLC, Plaintiff, v. COOLPAD TECHNOLOGIES, INC. AND YULONG COMPUTER COMMUNICATIONS, Defendants.	C.A. No. 3:18-cv-1783-CAB-BLM Judge: Hon. Cathy Ann Bencivengo Magistrate Judge: Hon. Barbara L. Major
BELL NORTHERN RESEARCH, LLC, Plaintiff, v. HUAWEI DEVICE (DONGGUAN) CO., LTD, HUAWEI DEVICE (SHENZHEN) CO., LTD., and HUAWEI DEVICE USA, INC., Defendants.	C.A. No. 3:18-cv-1784-CAB-BLM
BELL NORTHERN RESEARCH, LLC, Plaintiff, v. KYOCERA CORPORATION and KYOCERA INTERNATIONAL INC., Defendants.	C.A. No. 3:18-cv-1785-CAB-BLM

BELL NORTHERN RESEARCH, LLC, Plaintiff, v. ZTE CORPORATION, ZTE (USA) INC., ZTE (TX) INC., Defendants.	C.A. No. 3:18-cv-1786-CAB-BLM

PLAINTIFF'S OPENING CLAIM CONSTRUCTION BRIEF

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I. INTRODUCTION

Pursuant to this Court's Case Management Order of October 15, 2018, Plaintiff Bell Northern Research, LLC's ("BNR") hereby submits its Opening Claim Construction Brief in the following cases, consolidated for pretrial purposes: *Bell Northern Research, LLC v. Coolpad Technologies, Inc., et al.*, No. 3:18-cv-1783; *Bell Northern Research, LLC v. Huawei Device USA, Inc., et al.*, No. 3:18-cv-1784; *Bell Northern Research, LLC v. Kyocera Corporation, et al.*, No. 3:18-cv-1785; and *Bell Northern Research, LLC v. ZTE Corporation, et al.*, No. 3:18-cv-1786.[1]

The consolidated cases involve eight patents: U.S. Patent No. 7,319,889 ("the '889 Patent"); U.S. Patent No. 8,204,554 ("the '554 Patent"); U.S. Patent No. 7,990,842 ("the '842 Patent"); U.S. Patent No. 8,416,862 ("the '862 Patent"); U.S. Patent No. 7,957,450 ("the '450 Patent"); U.S. Patent No. 6,941,156 ("the '156 Patent"); U.S. Patent No. 8,792,432 ("the '432 Patent"); and U.S. Patent No. 7,039,435 ("the '435 Patent") (collectively, the "Asserted Patents").

BNR's proposed constructions adhere to the well-known principles of claim construction and are based on the plain and ordinary meaning of the terms at issue, taking into account the specification's teachings. Defendants' proposed constructions, on the other hand, generally seek to import extraneous limitations or ignore key disclosures in an attempt to manufacture non–infringement and invalidity positions. Because BNR's constructions are consistent with the canons of patent law and properly balance granting the full scope of applicants' invention while ensuring that the public has proper notice of the scope of the invention, BNR respectfully requests that the Court adopt its proposed constructions for the disputed terms described below.

[1] BNR's expert's opinions cited herein are offered against the Huawei, Coolpad, and Kyocera Defendant Groups.

II. LEGAL STANDARD

Claim construction is the process by which "the meaning and scope of the patent claims asserted to be infringed" is determined. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). This is a task for the Court. *Id.* at 979.

A. The scope of a patent is defined by the plain import of its claims.

It is fundamental patent law that a patent's claims define the patent's scope. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). Thus, "the claim construction inquiry . . . begins and ends . . . with the actual words of the claim." *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 365 F.3d 1299, 1303 (Fed. Cir. 2004) (quoting *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1248 (Fed. Cir. 1998)); *Blast Motion, Inc. v. Zepp Labs, Inc.*, No. 15-CV-700 JLS (NLS), 2017 U.S. Dist. LEXIS 16549, at *3 (S.D. Cal. Feb. 6, 2017). Given the express statutory purpose of the patent claim—"to particularly point[] out and distinctly claim[]" the invention—it is "unjust to the public, as well as an evasion of law, to construe it in a manner different from the plain import of its terms." *Phillips*, 415 F.3d at 1312 (quoting *White v. Dunbar*, 119 U.S. 47, 52 (1886)); 35 U.S.C. § 112(2). Specifically, limiting the claims by the exemplary embodiments described in the patent document is "one of the cardinal sins of patent law." *Phillips*, 415 F.3d at 1320. This is true even if the patentee described only one embodiment in the patent. *Id.* at 1323.

B. A claim term is given its full ordinary and customary meaning unless the patentee: (i) clearly otherwise defined the term, or (ii) unequivocally disclaimed the full scope of the term.

"The words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art when read in the context of the specification and prosecution history." *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (citing *Phillips*, 415 F.3d at 1313); *accord CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) ("Generally speaking, we indulge a heavy presumption that a claim term carries its ordinary and customary meaning." (internal quotation marks omitted)). "There are only two exceptions to this rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of the claim term either in the specification or during prosecution." *Thorner*, 669 F.3d at 1365 (*citing Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1580 (Fed. Cir. 1996)); *accord K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1362–63 (Fed. Cir. 1999) ("The ordinary and accustomed meaning of a disputed claim term is presumed to be the correct one subject to . . . a different meaning clearly and deliberately set forth in the intrinsic material." (citations omitted)). Ultimately, "[t]he patentee is free to choose a broad term and expect to obtain the full scope of its plain and ordinary meaning unless the patentee explicitly redefines the term or disavows its full scope." *Thorner*, 669 F.3d at 1367.

III. <u>CLAIM CONSTRUCTION REGARDING THE GORIS PATENTS</u>

A. Background of the Inventions

The '889 and '554 Patents, the "Goris Patents," belong to the same patent family; the '554 Patent is a continuation of the '889 Patent. Each patent is entitled "System and Method for Conserving Battery Power in a Mobile Station" and claims priority to an earlier application filed on June 17, 2003.

The Goris Patents relate to inventions that help reduce cell phone consumption of battery power. The specification notes that "the stand-by time, as well as the talk-time, of a mobile station depend on the lifetime of a (rechargeable) battery inserted within the mobile station and hence, on the load and/or on the capacity of the battery." (Ex. A, '889 Patent at 1:27–30; Ex. C; '554 Patent at 1:28–31.) The specification further notes the problems in the prior art stemming from increasing the capacity of the battery: "batteries having increased capacities are often larger, heavier or more expensive, none of which are desirable attributes for a portable, affordable mobile station." (Ex. A, '889 Patent at 1:31–35; Ex. C, '554 Patent at 1:32–36.)

Thus, the Goris Patents describe "a way to prolong the lifetime of a mobile station without having to use a battery with an increased capacity," and they do so by focusing on the power supply to the display of the phone. (Ex. A, ’889 Patent at 1:35–37; Ex. C, ’554 Patent at 1:36–38.) The claims are drawn to systems and methods that include (among other things) use of a proximity sensor and processor “adapted to cause power consumption of the display to be reduced when the display is within a predetermined range of an external object,” such as a user’s ear. (Ex. A, ’889 Patent at 1:44–46; Ex. C, ’554 Patent at 1:45–47; *see also*, *e.g.*, Claim 1.) The specification explains that “by reducing the power consumption of the display of an activated telephone set in [the] case [that] the display is not needed, i.e., in particular during a telephone call, current is saved instead of needlessly consumed from the (rechargeable) battery. Accordingly, the spared available battery power may be significant, especially for color displays, resulting in an overall increasement of the stand-by and/or talk time of the telephone set.” (Ex. A,’889 Patent at 1:47–54; Ex. C, ’554 Patent at 1:48–55.)

B. “a signal indicative of proximity of an external object” and “a signal indicative of the existence of a first condition, the first condition being that an external object is proximate”

Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
Plain and ordinary meaning. To the extent the Court determines that a specific construction is warranted, BNR proposes: “a signal that an external object is within a predetermined range”	“a signal that an external object is or is not within a predetermined range”

These terms appear in the following claims in the Goris Patents, and there is a difference in language between the ’889 Patent term and the ’554 Patent terms:

’889 Patent Claim 1	’554 Patent Claim 1	’554 Patent Claim 14
A mobile station, comprising:	A mobile station, comprising:	A mobile station, comprising:

’889 Patent Claim 1	’554 Patent Claim 1	’554 Patent Claim 14
a display; a proximity sensor adapted to generate **a signal indicative of proximity of an external object**; and a microprocessor adapted to: (a) determine whether a telephone call is active; (b) receive the signal from the proximity sensor, and (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object; wherein: the telephone call is a wireless telephone call; the microprocessor reduces power to the display while the signal indicates the proximity of the external object only if the microprocessor determines that the wireless telephone call is active; and the proximity sensor begins detecting whether	a display; a proximity sensor adapted to generate **a signal indicative of the existence of a first condition, the first condition being that an external object is proximate**; and a microprocessor adapted to: (a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call; (b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor; (c) receive the signal from the activated proximity sensor; and (d) reduce power to the display if the signal from the activated proximity	a display; a proximity sensor adapted to generate **a signal indicative of the existence of a first condition, the first condition being that an external object is proximate**; and a microprocessor adapted to: (a) determine, independently of the determination whether the external object is proximate, the existence of a second condition different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call; (b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor; (c) receive the signal from the activated proximity sensor; and

’889 Patent Claim 1	’554 Patent Claim 1	’554 Patent Claim 14
an external object is proximate substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless call.	sensor indicates that the first condition exists.	(d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists.

The only dispute regarding the definition of this claim term centers on Defendants’ insertion of the three words “or is not,” effectively requiring that the proximity sensor be adapted to generate a signal when an external object *is not* within a predetermined range. But Defendants cannot point to any support in the intrinsic record that requires the proximity sensor of these three claims to be adapted to generate a signal to show that something *is not* there. Nor do the Defendants cite any extrinsic evidence, including any expert testimony, that a person of ordinary skill in the art would interpret the claim term to require a signal indicating the absence of an object within a predetermined range. On the contrary, the specification invariably refers to a determination that an external object *is* within a predetermined range. For instance, in the specification:

- “The proximity sensor is coupled to the chassis and causes the power consumption to be reduced when the ***display is within*** a predetermined range of an external object.” (Ex. A, ’889 Patent at Abstract; Ex. C, ’554 Patent at Abstract.)
- “…a proximity sensor coupled to the chassis and adapted to cause a power consumption of the display to be reduced when the ***display is within*** a predetermined range of an external object.” (Ex. A, ’889 Patent at 1:43–46; Ex. C, ’554 Patent at 1:44–47.)

- "If the proximity sensor 140 ***detects an external object*** (such as the user's ear) ***within*** the monitored range…" (Ex. A, '889 Patent at 3:20–22; Ex. C, '554 Patent at 3:21–23.)
- "…***detecting*** an attachment of the set, in particular of the display of said set ***near to an object***, in particular to the ear…" ('889 Patent at 2:20–22; Ex. C, '554 Patent at 2:21–23.)
- "If the proximity sensor 140 ***detects an external object*** (such as the user's ear) ***within the monitored range***…" (Ex. A, '889 Patent at 3:20–22; Ex. C, '554 Patent at 3:21–23.)
- "…the proximity sensor 140 ***detects proximity*** to an external object…" (Ex. A, '889 Patent at 3:36–37; Ex. C, '554 Patent at 3:37–38.)
- "…the proximity sensor 140 again ***detects an object***. . . " (Ex. A, '889 Patent at 3:57–58; Ex. C, '554 Patent at 3:57–58.)

Similarly, the file histories for the Goris Patents evidence no requirement of a signal that an object *is not* there. (Ex. B; Ex. D.)

Even in a scenario where the external object is moved away from the display or proximity sensor, which the patent specifically contemplates, there is no requirement that the proximity sensor must generate a "negative signal" (i.e., a signal that something *is not* within a predetermined range). For example, the specification states, "the means may be further adapted to switch-on the display in response to a detection that the set, preferably the display of the set, is moved away from any object, in particular from the ear." (Ex. A, '889 Patent at 2:6–9; Ex. C, '554 Patent at 2:7–10; *see also* Ex. A, '889 Patent at 3:48–58; Ex. C, '554 Patent at 3:48–58.) Nothing in the patent forecloses an embodiment where the ***absence*** of a signal that an external object is proximate would allow the display to switch back on. In fact, the specification describes an embodiment that is wholly consistent with the absence of a signal indicating proximity to an external object:

> Moreover, ***if the proximity sensor 140 is directly activated by an incoming call*** or automatically activated, the display can be kept in a Switched-off condition as long as the mobile station 110 is, for example, ***within a pocket*** (not referenced) or the like and is only switched on when the user retrieves the mobile station 110 from the pocket to enable the user to look on the display 150 for an information about the calling party. If the user then wants to accept the call and thence places the mobile station 110 proximate an external object, such as his ear, the ***proximity sensor 140 again detects an object***, causing the display again to be switched off.

(Ex. A, '889 Patent at 3:48–68 (emphasis added); Ex. C, '554 Patent at 3:48–58.) These disclosures, coupled with the fact that there is nothing in the claim language itself to indicate that a negative signal is required, supports BNR's proposal. *See Phillips*, 415 F.3d at 1315 ("[T]he specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.") (citation omitted).

Moreover, focusing on the disputed language in Claim 1 and 14 of the '554 Patent yields further support to BNR's interpretation that the generated signal need only indicate that an external object is within a predetermined range: "a signal indicative of the existence of a first condition, the first condition being <u>that an external object is proximate</u>" (emphasis added). Here, the claim language makes it clear that the subject of the signal is "that an external object is proximate." Defendants' attempt to insert an "or is not" into this very clear language describing the signal is unsupported.

In the parties' claim construction exchanges, the sole piece of evidence that Defendants have relied upon to support the "is or is not" portion of their proposed definition is Claim 2 of the '554 Patent:

> The mobile station of Claim 1, further comprising increasing power to the display if the signal from the activated proximity sensor indicates that the first condition no longer exists.

Defendants argue that because this dependent claim requires that the increasing of power to the display is conditional on "the signal from the activated proximity sensor indicates that the first condition no longer exists," the independent Claim 1, a different independent claim in the same patent that Claim 2 does not depend from, and an independent claim from a different but related patent must also be read to require a signal that "indicates that the first condition no longer exists." But that argument is erroneous because it is black letter law that the requirements of a dependent claim cannot be imported into a construction for an independent claim. *Nazomi Communs., Inc. v. ARM Holdings, PLC*, 403 F.3d 1364, 1370 (Fed. Cir. 2005) ("[L]imitations stated in dependent claims are not to be read into the independent claim from which they depend."). Indeed, under Federal Circuit case law, "the presence of a dependent claim that adds a particular limitation gives rise to a ***presumption*** that the limitation in question ***is not present in the independent claim***." *Phillips*, 415 F.3d at 1314–1315 (emphasis added) ("Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.").

BNR has never argued that sending a signal that "indicates that the first condition no longer exists" is inconsistent with or precluded by the requirements of Claim 1. ***But Claim 1 does not require it***. And Defendants' attempt to import that requirement from a dependent claim, without any intrinsic or extrinsic support, lacks any support in the face of this strong presumption. *See, e.g.*, *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004) (reversing district court's claim construction finding where "[t]he juxtaposition of independent claims lacking any reference to a pressure jacket with dependent claims that add a pressure jacket limitation provides strong support for [the] argument that the independent claims were not intended to require the presence of a pressure jacket.").

Finally, Defendants' proposed construction, in addition to lacking any intrinsic or extrinsic support, is also inconsistent with Defendants' agreement with BNR on another term that appears further in the '889 Patent claim identified above (as well as in other claims). The parties have agreed that the term "the signal indicates the proximity of the external object" as it appears twice in the underlined portions of

Claim 1 of the '889 Patent below[2] means, "the signal is that an external object is within a predetermined range"—remarkably similar to BNR's proposal for the disputed term.

> A mobile station, comprising:
>
> a display;
>
> a proximity sensor adapted to generate a signal indicative of proximity of an external object; and
>
> a microprocessor adapted to:
>
> (a) determine whether a telephone call is active;
>
> (b) receive the signal from the proximity sensor, and
>
> (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) **the signal indicates the proximity of the external object**; wherein:
>
> the telephone call is a wireless telephone call;
>
> the microprocessor reduces power to the display while **the signal indicates the proximity of the external object** only if the microprocessor determines that the wireless telephone call is active; and
>
> the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless call.

But the only difference between this agreed-upon term and the disputed term is that one (the agreed-upon) begins with "the signal indicates the" and the other (the disputed) begins with "a signal indicative of." The remainder of the term, "proximity of an external object," is identical. Defendants' insertion of "or is not" into the

[2] This agreed-upon term also appears in Claim 2 of the '889 Patent.

disputed term while leaving it out of the agreed-upon term cannot be explained by the difference in language, because the subject of the signal—"proximity of an external object"—is exactly the same. Defendants' proposed construction, which adds an "is not" to the proximity in one case and omits it in the other, seeks to apply different meanings to the same term, which is against basic principles of claim construction. *See, e.g.*, *Digital Biometrics v. Identix, Inc.*, 149 F.3d 1335, 1345 (Fed. Cir. 1998) ("[T]he same word appearing in the same claim should be interpreted consistently."); *Cloud Farm Assocs. LP v. Volkswagen Grp. of Am., Inc.*, 674 Fed. Appx. 1000, 1006 (Fed. Cir. 2017) ("The same term should be construed consistently throughout the same patent and any related patents sharing a common specification.") (citing *CVI/Beta Ventures, Inc. v. Tura LP*, 112 F.3d 1146, 1159 (Fed. Cir. 1997) ("[W]e are obliged to construe the [asserted term] consistently throughout the claims.")); *Nazomi Communs.*, 403 F.3d at 1370 ("The court must consider not only that different embodiments are possible, but also that the meaning of 'instruction' in the claims must be the same in all of them.").

IV. CLAIM CONSTRUCTION REGARDING U.S. PATENT NO. 7,990,842

A. Background of the Invention

The '842 Patent is entitled "Backward-Compatible Long Training Sequences for Wireless Communication Networks" and claims priority to a date no later than July 2004. The '842 Patent was conceived against the backdrop of the 802.11 standard for WiFi promulgated by the Institute of Electrical and Electronics Engineers ("IEEE"). The specification explains that "different wireless devices in a wireless communication system may be compliant with different standards or different variations of the same standard," such as the versions of 802.11 that had already issued or were being developed at the time (i.e., 802.11a, 802.11b, 802.11g, and the then under development 802.11n). (Ex. E, '842 Patent at 1:50–60.) The newer versions of the 802.11 standard enabled more data to be transferred at a faster speed.

Because the 802.11 is an evolving standard, "[w]hen devices that are compliant with multiple versions of the 802.11 standard are in the same [wireless network], the devices that are compliant with older versions are considered to be legacy devices. To ensure backward compatibility with legacy devices, specific mechanisms must be employed to insure that the legacy devices know when a device that is compliant with a newer version of the standard is using a wireless channel to avoid a collision." (Ex. E, '842 Patent at 1:63–2:2.) This way, the patent specification explains, "legacy" devices can still communicate in systems using new protocols. (Ex. E, '842 Patent at 2:3–7.) The 802.11 standard uses an encoding scheme that "spread[s] a single data stream over a band of sub-carriers, each of which is transmitted in parallel." (Ex. E, '842 Patent at 2:12–14.) The standard includes "training sequences" that synchronize data transfer between a wireless sender and a receiver. (Ex. E, '842 Patent at 2:31–33.) At the time, the existing version of the 802.11 standard utilized a training sequence with 52 active subcarriers. (Ex. E, '842 Patent at 2:15–17, 24–28.)

The '842 Patent teaches longer "training sequence[s] of minimum peak-to-average ratio that uses more sub-carriers without interfering with adjacent channels." (Ex. E, '842 Patent at 2:37–39.) The patentees described specific embodiments of longer training sequences utilizing 56 and 63 subcarriers that also had minimum peak-to-average power ratios, which decreased power back-off. Power Amplifiers used in radio transmitters have nonlinear characteristics that cause significant distortion at the output when input signals are large enough to cause the power amplifier to enter a nonlinear saturation region. Therefore, amplifiers are operated with a certain safety margin, called "power back off," which can be generally defined as the ratio of maximum or peak saturation output power to average output power, the "PAPR." Increasing the back off while reducing the nonlinear distortion, can also result in overall lower amplifier efficiency and higher overall power consumption and battery drain. Therefore, a trade-off that minimizes power back-off subject to design constraints is desired. For example, Figure 4 details "the long training sequence with a minimum peak-to-average power ratio that is used in 56 active subcarriers":

+1	+1	1	1	-1	-1	1	1	-1	1	-1	1	1	1
-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15

Sub-carrier index

1	1	1	-1	-1	1	1	-1	1	-1	1	1	1	1	0
-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0

Sub-carrier index

+1	-1	-1	1	1	-1	1	-1	1	-1	-1	-1	-1	-1
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Sub-carrier index

1	1	-1	-1	1	-1	1	-1	1	1	1	1	-1	-1
15	16	17	18	19	20	21	22	23	24	25	26	27	28

Sub-carrier index

LONG TRAINING SEQUENCE FOR 56 ACTIVE
FIGURE 4

(Ex. E, '842 Patent at 5:14–19; Fig. 4.)

B. Person of Ordinary Skill in the Art

A person of ordinary skill in the art ("POSITA") for the '842 Patent would have a bachelor's degree in electrical engineering, computer engineering, computer science or similar field, and two to three years of experience in digital communications systems, such as wireless communications systems and networks, or equivalent. Moreover, someone with more technical education but less experience could have also met this standard. (Ex. L, Madisetti Op. Decl. ¶ 154.)

C. "Inverse Fourier transformer"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
Plain and ordinary meaning. To the extent the Court determines that a specific construction is warranted, BNR proposes:	"a circuit and/or software that performs a defined mathematical function that transforms a series of

“circuit and/or software that at least performs an inverse Fourier transform.”	values from the frequency domain into the time domain”

This term appears in Claim 1 of the ’842 Patent:

> A wireless communications device, comprising:
>
> a signal generator that generates an extended long training sequence; and
>
> an **Inverse Fourier Transformer** operatively coupled to the signal generator,
>
> wherein the **Inverse Fourier Transformer** processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and
>
> wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme.

The ‘842 Patent teaches that a network device includes an inverse Fourier transform for processing the extended long training sequence from a signal generating circuit:

- “The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio.”
- “The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training

> sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 52 sub-carriers."

(Ex. E, '842 Patent at Abstract, 2:51–58; *see also id*. 2:63–3, 3:6–15 (similar).)

In the specification's "Detailed Description of the Invention" section, referring to Figure 2, the patentees teach:

> **The inventive long training sequence is inputted into an Inverse Fourier Transform 206**. The invention uses the same +1 or -1 BPSK encoding for each new sub-carrier**. Inverse Fourier Transform 206 may be an inverse Fast Fourier Transform (IFFT) or Inverse Discrete Fourier Transform (IFDT). Inverse Fourier Transform 206 processes the long training sequence from signal generating circuit 205** and thereafter produces an optimal expanded long training sequence with a minimal peak-to-average power ratio. The optimal expanded long training sequence may be used in either 56 active sub-carriers or 63 active subscribers.

(Ex. E, '842 Patent at 4:50–61 (emphasis added).)

Fourier transform is a well-known and understood mathematical principle encountered by math and engineering students in a college-level math course. (Ex. L, Madisetti Op. Decl. ¶ 186.) A Fourier transform operates in one-dimension or in multiple-dimensions to map functions between one domain and another domain. These domains can include, but are not limited to, space, time, frequency, or another variable. (Ex. L, Madisetti Op. Decl. ¶ 187.)

The specification provides no specific constraints or limitations on the term "inverse Fourier transformer." Likewise, the claim language does not functionally restrict the "inverse Fourier transformer" and mandate a specific type of transformation or identify specific variable or domains for transformation:

> A wireless communications device, comprising: a signal generator that generates an extended long training

> sequence; **and an Inverse Fourier Transformer operatively coupled to the signal generator, wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio**, and wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme.

A person of ordinary skill in the art at the time of the invention would understand that an inverse Fourier transform is just what the name implies—the reverse of a Fourier transform operation. Below is a generic mathematical representation of two definitions of a Fourier transform, where one of them is the inverse or reverse of the other (i.e., f() is inverse of F(), and vice versa):

$$F(s) = \int_{-\infty}^{\infty} f(x)e^{-i2\pi xs}\,dx$$

$$f(x) = \int_{-\infty}^{\infty} F(s)e^{i2\pi xs}\,ds.$$

(*See* Ex. U at Appx560 ("[T]he customary formulas exhibiting the reversibility of the Fourier transformation are . . . . In this form, two successive transformations are made to yield the original function."). Of importance, the equations do not require space, time, frequency, or any other specific variable. Similarly, even contemporaneous dictionary definitions define "Fourier Transform" broadly as "a mapping function, as a signal, that is defined in one domain, as space or time, into another domain, as wavelength or frequency, where the function is represented in terms of sines and cosines." (Ex. Q at Appx230 (definition of "Fourier Transform.") *See Symantec Corp. v. Computer Assocs. Int'l, Inc.*, 522 F.3d 1279, 1291 (Fed. Cir. 2008) (quoting *Phillips*, 415 F.3d at 1318) ("Dictionaries are 'among the many tools that can assist the court in determining the meaning of particular terminology to those of skill in the art of the invention.'"); *L.B. Plastics, Inc. v. Amerimax Home Prods.*, 499 F.3d 1303, 1308 (Fed. Cir. 2007).

Therefore, because the intrinsic record does not place any restrictions on "inverse Fourier transformer," a POSITA would simply understand the term to mean "circuit and/or software that at least performs an inverse Fourier transform," a well-known mathematical operation. (Ex. L, Madisetti Op. Decl. ¶ 190.) *See Riverwood Int'l Corp. v. RA. Jones & Co.*, 324 F.3d 1346, 1357 (Fed. Cir. 2003) ("In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves…")

Defendants' proposed construction of a "mathematical function that transforms a series of values from the frequency domain into the time domain" is wrong for several reasons. *First*, as mentioned above, the Fourier transform and inverse Fourier transform operations are agnostic—there is no requirement to transform values from a frequency domain into a time domain or vice versa. A Fourier transform could be used to transform values from a frequency domain into a time domain, likewise and a Fourier transform could also transform values into a time domain into a frequency domain. (Ex. N, Madisetti Sur-Rebuttal Decl. ¶ 9.) Even Defendants' expert admits that "the Fourier transform ***could*** map one domain to another in a broad mathematical sense." (Ex. R, Wells Rebuttal Decl. ¶ 8.) Defendants' requirement that the transformation occurs *from* the frequency domain *into* a time domain, adds both a direction limitation and variable limitations (time and frequency) not required by the specification or the claim. *See Dayco Prods. v. Total Containment, Inc.*, 258 F.3d 1317, 1327 (Fed. Cir. 2001) ("In each of the three claim constructions discussed above, the district court erroneously read a limitation into the claim language. Our cases make clear, however, that adding limitations to claims not required by the claim terms themselves, or unambiguously required by the specification or prosecution history, is impermissible."); *Aventis Pharma S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1330 (Fed. Cir.

2012) ("We previously have refused to impose such limitations when not required by the language of the claims or the specification, and decline to do so here.") (internal citations omitted). Adopting Defendants' proposed construction would amount to an impermissible redrafting of the claims. *See Ecolab, Inc. v. FMC Corp.*, 569 F.3d 1335, 1344 (Fed. Cir. 2009) ("It is likewise well-settled that courts generally may not re-draft claims; we must construe the claims as written."); *Becton Dickinson & Co. v. C.R. Bard, Inc.*, 922 F.2d 792, 799 n.6 (Fed. Cir. 1990) ("Nothing in any precedent permits judicial redrafting of claims."). Therefore, Defendant's proposed construction is overly restrictive in light of the claim language, and the generally understood meaning of inverse Fourier transform. (Ex. L, Madisetti Op. Decl. ¶ 192.)

Second, Defendants' expert Dr. Wells' acknowledges that a "Fourier transform ***could*** map one domain to another in a broad mathematical sense," but argues that the construction of the term should be narrowed because the patent is within the field of wireless communications. (Ex. R, Wells Rebuttal Decl. ¶¶ 8–9.) However, the term under construction is "inverse Fourier transformer," not "inverse Fourier transformer in wireless communications."

Third, Dr. Wells is wrong to suggest that from a technical point of view, in wireless communications, the inverse Fourier transform can *only* map between the time domain and frequency domain as a matter of fact. (Ex. N, Madisetti Sur-Rebuttal Decl. ¶ 7.)

For instance, a peer-reviewed and published academic paper entitled "Discrete Fourier Transform based Multimedia Colour Image Authentication for **Wireless Communication** (DFTMCIAWC)," (emphasis added) shows the exemplary use of an inverse Fourier transform to "transform [an] embedded image from **frequency** domain to **spatial** domain" (emphasis added). Equation 1 of this reference further shows exemplary forward mapping between frequency and spatial domains in the wireless communications area between two 2-dimensional domains, (x, y) and (u, v) respectively:

$$F(u,v) = \frac{1}{\sqrt{MN}} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x,y)\, e^{-j2\pi\left(\frac{ux}{M}+\frac{vy}{N}\right)}$$

(Ex. N, Madisetti Sur-Rebuttal Decl. ¶ 8; Ex. V at Appx563.)

Similarly, another peer-reviewed and published academic paper entitled "Spatial Channel and System Characterization" discussing multi-antenna (wireless) communications systems, shows that an example of an "inverse Fourier transform converts a signal from **wave vector** domain to **space** domain" (emphasis added). Equations 2 and 3 of this reference show exemplary mapping between the wave vector and spatial domains in a Fourier transform and corresponding inverse Fourier transform in the context of wireless communications.

$$\begin{aligned} G(\vec{k}) &= \int g(\vec{r})e^{j\vec{r}\cdot\vec{k}}d^3r \\ g(\vec{r}) &= \frac{1}{(2\pi)^3}\int G(\vec{k})e^{-j\vec{k}\cdot\vec{r}}d^3k \end{aligned}$$

(Ex. N, Madisetti Sur-Rebuttal Decl. ¶ 9, Ex. W at Appx569.) These are "two examples of references that support[ing] []that the plain and ordinary, mathematical meaning of an inverse Fourier transform still applies in wireless communications and a definition that must use time to frequency mapping or vice versa is just an example of its use, and not a correct definition or construction even when restricted to wireless communications." (Ex. N, Madisetti Sur-Rebuttal Decl. ¶ 9.)

Thus, even in the context of wireless communications, inverse Fourier transforms are not limited to conversions between time and frequency domains. Nor are they limited it to a single variable in these or other domains (time, frequency, space, symbol, wave-vectors, …) (Ex. N, Madisetti Sur-Rebuttal Decl. ¶ 10.)

Dr. Wells also justifies his opinion incorporating Defendants' direction and variable limitations by pointing the specification's disclosure of a fast Fourier transform, which he says is "a specific algorithmic implementation of a Fourier transform (FFT)." (Ex. R, Wells Rebuttal Decl. ¶ 11.) This presents several problems because even Dr. Wells concedes the FFT is a "specific algorithmic implementation" and the specification confirms that a FFT is merely one embodiment. (*See* Ex. E, '842 Patent at 4:53–55 ("Inverse Fourier Transform 206 may be an inverse Fast Fourier Transform (IFFT) or Inverse Discrete Fourier Transform (IDFT).")). *See Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.").

In addition, Claim 9, which depends from Claim 1, adds the limitation "wherein the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer." Thus, there is a presumption that Dr. Wells's "specific algorithmic implementation" cannot be read into Claim 1. "Under the doctrine of claim differentiation, when one claim does not recite a particular limitation that is recited in another claim, 'that limitation cannot be read into the former claim.'" *Baxter Healthcare Corp. v. Fresenius Med. Care Holdings, Inc.*, No. C 07-1359, 2009 U.S. Dist. LEXIS 14842, at *13 (N.D. Cal. Feb. 10, 2009) (quoting *Amgen, Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1326 (Fed. Cir. 2003)); *TurboCare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1123 (Fed. Cir. 2001) (Claim terms should not be read to contain a limitation "where another claim restricts the invention in exactly the [same] manner.").

The Court should adopt BNR's proposed definition of this term because its construction adheres to well-established principles of claim construction and is consistent with how a POSITA would understand the term, while Defendants' construction violates black-letter patent law.

V. CLAIM CONSTRUCTION REGARDING U.S. PATENT NO. 8,416,862

A. Background of the Invention

The ’862 Patent is entitled “Efficient Feedback of Channel Information in a Closed Loop Beamforming Wireless Communication System” and claims priority to a date no later than April 2005. The ’862 Patent is related to wireless communications using beamforming. Beamforming is a process that allows for adapting an RF transmission (for example, WiFi) so that the intended recipient receives a stronger signal. When a transmitter is sending out an RF signal, the signal can become degraded by mixing with other signals, by passing through objects, or simply due to the distance that it must cover. Beamforming alters the properties of that RF signal to send it more directly to the recipient in a line and minimizing surrounding signal interference to increase the strength. To properly implement beamforming, the transmitter must know the properties of the channel, which is signal and noise, over which the wireless communication is conveyed. This is called feedback information. Without any modification, the feedback information required to be sent back to the wireless transmitting device may be so large that the channel may change before the entire feedback information is received by the transmitter.

The ’862 Patent’s claims describe improvements on transmitting feedback of transmitter beamforming information. In particular, they describe a way for the receiving device to manipulate, through mathematical techniques, the data that represents an estimate of the channel information required and further minimize and manipulate the data that must be sent back to the transmitter through mathematical techniques. One of the important technical advantages and improvements offered by the invention is a decrease in the amount of data required to send the feedback information to the transmitting wireless transmitter, which allows beamforming to occur more efficiently. (Ex. F, ’862 Patent at 16:1–6.)

B. Person of Ordinary Skill in the Art

A Person of Ordinary Skill in the Art ("POSITA") for the '862 Patent would have a bachelor's degree in electrical engineering, computer engineering, computer science or similar field, and two to three years of experience in digital communications systems, such as wireless communications systems and networks, or equivalent. Moreover, someone with more technical education but less experience could have also met this standard. (Ex. L, Madisetti Op. Decl. ¶ 88.)

B. "decompose the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
Plain and ordinary meaning. In the alternative, to the extent the Court determines that a specific construction is warranted, BNR proposes: "factor the estimated transmitter beamforming unitary matrix (V) to produce a reduced number of quantized coefficients"	"factor the estimated transmitter beamforming unitary matrix (V) to produce a reduced set of angles"

The term "decompose the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information" appears in Claim 9 of the '862 Patent:

> 9. A wireless communication device comprising:
>
> a plurality of Radio Frequency (RF) components operable to receive an RF signal and to convert the RF signal to a baseband signal; and
>
> a baseband processing module operable to:
>
> receive a preamble sequence carried by the baseband signal;
>
> estimate a channel response based upon the preamble sequence;

> determine an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U);
>
> ***decompose the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information***; and
>
> form a baseband signal employed by the plurality of RF components to wirelessly send the transmitter beamforming information to the transmitting wireless device.

(Ex. F, '862 Patent Claim 9.)

A person of ordinary skill in the art at the time of the invention would have understood this term to mean: "factor the estimated transmitter beamforming unitary matrix (V) to produce a reduced number of quantized coefficients." There is no dispute regarding the first portion of the construction; specifically that "decompose the estimated transmitter beamforming unitary matrix (V) to produce" means "factor the estimated transmitter beamforming unitary matrix (V) to produce." Thus, the dispute centers on whether factoring the estimated transmitter beamforming unitary matrix (V) results in "a reduced number of quantized coefficients" as BNR contends, or "a reduced set of angles," as Defendants contend.

BNR's construction is consistent with both the claim language and specification, and is further supported by extrinsic evidence. Defendants' construction finds no anchor in the intrinsic record and selectively incorporates extrinsic references to support it. The specification identifies a clear example of what this transmitter beamforming information is:

> As the reader will appreciate, the ***coefficients*** of the Givens Rotation and the phase matrix ***coefficients*** serve as ***the transmitter beamforming information*** that is sent from the receiving wireless communication device to the transmitting wireless communication device.

(Ex. F, '862 Patent at 15:34–38 (emphasis added).[3]

The use of the term "coefficients" in BNR's proposal aligns with this portion of the specification. First, for the phase matrix, the specification specifically refers to the entries in that matrix as coefficients. *See id.* And regarding the Givens Rotation, Dr. Min acknowledged during deposition that the values of the result of the Givens Rotation are coefficients:

> Q. The result of a Givens Rotation is two matrices, right?
> A. Yes, product of the two matrices.
> Q. And you already said that the values of the matrices are called coefficients, right, commonly?
> A. Yeah, sure. That's some number.

(Ex. P, Min Dep. at 101:6–12.) Thus, BNR's use of the term coefficients in its construction to describe the result of the factoring is well supported by the intrinsic record. *See Scripps Research Inst. V. Illumina, Inc.* No. 16-cv-661 JLS (BGS), 2018 U.S. Dist. LEXIS 60928, at *5–6 (S.D. Cal. Apr. 10, 2018) ("Usually, the specification is dispositive; it is the single best guide to the meaning of a disputed term." (quoting *Vitronics*, 90 F.3d at 1582).

Further, a person of ordinary skill in the art would also understand that the reduced set of coefficients are quantized coefficients. In understanding why a person of skill in the art would understand that the coefficients are quantized, it is important to note the surrounding claim language that indicates what happens with the transmitter beamforming information: that the bandwidth processing module forms "a baseband signal employed by the plurality of RF components ***to wirelessly send*** the transmitter beamforming information to the transmitting wireless device." (Ex. F, '862 Patent

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[3] While this example refers to decomposition using Givens Rotation, it is not limiting as to the type of matrix decompositions within the scope of the claim. Dependent claim 5, for example, claims decomposing using a QR decomposition technique and dependent claim 6 comprises where the QR decomposition technique of claim 5 comprises a Givens Rotation operation. (*See* Ex. F, '862 Patent at Claims 5-6.) In both cases, the decomposition is matrix factorization and results in product matrices, and the use of the term coefficients is therefore consistent.

Claim 9 (emphasis added).) Quantization is, in effect, trading exactness or precision for finiteness and, as a result, size. As Dr. Madisetti stated, "as used in the patent and as understood by a person of skill in the art, quantization is reducing a larger set of possible values to a smaller set." (Ex. L, Madisetti Op. Decl. ¶ 94.)

This quantization occurs most often in digital signal processing as approximation by fixing the length of the bits for the value that otherwise would far exceed that length. Dr. Min offered a similar explanation for quantization: "In any formable digital communications, you would have to fix the – what we call the precision of the number. Sometimes you use 8 bits, 16 bits, 32 bits, sometimes even 64 bits, that's just to indicate a floating number of any kind." (Ex. P, Min Dep. at 97:10–14; *see also* Ex. O, Min Op. Decl. ¶ 180 ("Quantization refers to the transformation of data into integer values").) Quantization is required because the alternative is unworkable in digital communications, because "if you want to transmit a true valuable angle, then you need ***infinite bits***, it is a real number." (Ex. P, Min Dep. at 94:7–18 (emphasis added).)

The specification, too, confirms that quantization is expected for the transmitter beamforming information. For example, in each instance where the patent discusses angles that relate to the V matrix and to feedback information, the patent goes on to discuss the number of bits and bytes required for the expression of those angles during feedback. (*See, e.g.*, Ex. F, '862 Patent at 10:40–65; 11:1–20; 11:21–55; 12:64–13:14; 14:48–15:17; 15:34–58.) There is no disclosure within the patent that contemplates the transmission of real values of angles, and therefore the transmitter beamforming information that is produced by factoring the estimated transmitter beamforming matrix (V) is a reduced number of quantized coefficients. *See Scripps Research*, 2018 U.S. Dist. LEXIS 60928, at *5–6 (the specification "is the single best guide to the meaning of a disputed term") (citation omitted).

In contrast, Defendants' construction cherry-picks one portion of the specification, ignores others and disregards context provided by the entirety of the specification and the claim language. Dr. Min cites to Col. 13:65–14:3 to support his and Defendants' construction. That excerpt states "[w]ith a decomposed matrix form for the estimated transmitter beamforming matrix (V), the set of angles fed back to the transmitting wireless device are reduced." (*See* Ex. O, Min Op. Decl. ¶¶ 176–77.) This is true; the ***goal*** of sending the transmitter beamforming information to the transmitting wireless device is to provide these angles (ψ and Φ) to the transmitting wireless device to regenerate V. But Defendants ignore the remaining portion of the specification and claims that describe ***how*** the angles are reduced and in what format the angles are fed back—as transmitter beamforming information. This ***how*** is described above and represents why the values are coefficients and not angles. The specification also supports why a person of ordinary skill in the art would understand that the coefficients are quantized for transmission. Dr. Min acknowledged this at deposition:

> **Q.** Now under your construction [for the decompose term], in what format are the angles transmitted to the transmitting wireless device?
> **A.** So what, what the patent specification says is you do unitary matrix V and you then decompose it using the Givens Rotation. Actually, you do it multiple times as necessary depending on the size of the B and then after that, ***the actually data sent back to the transmitter is, uh***, ***quantized information***.

(Ex. P, Min Dep. at 88:12–22 (emphasis added).) Dr. Min attempts to support his opinions by stating, "Now, having said that, that is not really what the claim says. The claim language does not say anything about transmitting, what is being transmitted." (*See* Ex. P, Min Dep. at 88:23–89:2.) But the claim language ***does*** address transmitting. The claim requires that the transmitter beamforming information is wirelessly sent back to the transmitter. (*See* Ex. F, '862 Patent at Claim 9). And a person of ordinary skill in the art would understand that, in order to send the information back in a wireless system, quantization must occur. (*See* Ex. L, Madisetti Op. Decl. ¶ 95.) *See Julius Zorn, Inc. v. Medi Mfg.*, No. 3:15-CV-02734-GPC-RBB, 2017 U.S. Dist. LEXIS 35826, at *4 (S.D. Cal. Mar. 13, 2017) ("Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." (quoting *Phillips*, 415 F.3d at 1313)).

VI. <u>CLAIM CONSTRUCTION REGARDING U.S. PATENT NO. 7,957,450</u>

A. Background of the Invention

The '450 Patent is entitled "Method and System for Frame Formats for MIMO Channel Measurement Exchange" and claims priority to a date no later than December 2004. Like the '862 Patent, the '450 Patent is related to wireless communications using beamforming. Many wireless devices contain multiple antennas that utilize signal processing techniques to directionally focus the transmission and reception of signals in a specific direction. The process of optimizing signals in a specific direction is known as "beamforming":

> Smart antenna systems combine multiple antenna elements with a signal processing capability to optimize the pattern of transmitted signal radiation and/or reception in response to the communications medium environment. **The process of optimizing the pattern of radiation is sometimes referred to as "beamforming," which may utilize linear array mathematical operations to increase the average signal to noise ratio (SNR) by focusing energy in desired directions.**

(*See* Ex. G, '450 Patent at 1:35–42 (emphasis added).)

The specification goes on to describe that, "[i]n conventional smart antenna systems, only the transmitter or the receiver may be equipped with more than one antenna, and may typically be located in the base transceiver station (BTS) where the cost and space associated with smart antenna systems have been perceived as more easily affordable than on mobile terminals such as cellular telephones." (Ex. G, '450 Patent at 1:42–48.) But "[w]ith advances in digital signal processing (DSP) integrated circuits (ICs) in recent years, multiple antenna multiple output (MIMO) systems have emerged in which mobile terminals incorporate smart antenna systems comprising multiple transmit antenna and multiple receive antenna." (Ex. G, '450 Patent at 1:53–

57.) When used in a wireless device, such as a home router, beamforming in a MIMO system increases WiFi signal strength by focusing signals to another wireless device, such as a cellular phone or tablet.

The patent notes that beamforming is challenging because focusing the transmission of wireless signals must be adjusted as the relative positions of the transmitting and receiving wireless device positions change relative to one another. (*See*, *e.g.*, Ex. G, '450 Patent at 2:33–56.) For example, when a user walks around their home with a phone or tablet using WiFi the directionality of the WiFi signal from the home router is adjusted to compensate for the movement of the phone or tablet relative to the router. Thus, information about the RF channel used to transmit information must be adapted or else "information loss between the transmitting mobile terminal and the receiving mobile terminal may result." (*See* Ex. G, '450 Patent at 4:22–24.)

The '450 Patent teaches "feedback mechanisms by which a receiving mobile terminal may feedback information to a transmitting mobile terminal to assist the transmitting mobile terminal in adapting signals which are sent to the receiving mobile terminal." (Ex. G, '450 Patent at 1:30–34.) Specifically, the '450 Patent claims a method of transmitting data via multiple radio frequency channels with more than one transmitting antenna, receiving feedback information, and modifying a transmission mode based on the feedback information. The method reduces the network resources required for beamforming operations freeing up bandwidth for other network traffic, such as data.

Singular Value Decomposition ("SVD") is a mathematical matrix decomposition technique for reducing a matrix to its constituent parts to make certain subsequent matrix calculations easier. By using (SVD), wireless devices decrease the quantity of information transmitted to other parts of the system, such as a base station, which conserves bandwidth making the beamforming process more efficient.

B. Person of Ordinary Skill in the Art

A Person of Ordinary Skill in the Art ("POSITA") for the '450 patent would have a bachelor's degree in electrical engineering, computer engineering, computer science or similar field, and two to three years of experience in digital communications systems, such as wireless communications systems and networks, or equivalent. Moreover, someone with more technical education but less experience could have also met this standard. (Ex. L, Madisetti Op. Decl. ¶ 129.)

C. "channel estimate matrices" / "matrix based on the plurality of channel estimates"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
Plain and ordinary meaning. In the alternative, to the extent the Court determines that a specific construction is warranted, BNR proposes: "one or more matrices that is based on an SVD decomposition of the estimates of the values of H(t)"	"matrix H_{est} for tones of different frequencies, where H_{est} contains estimates of the true values of H(t)"

The term in question is highlighted below in Claim 1 of the '450 Patent:

> A method for communication, the method comprising:
>
> computing a plurality of **channel estimate matrices** based on signals received by a mobile terminal from a base station, via one or more downlink RF channels, wherein said plurality of **channel estimate matrices** comprise coefficients derived from performing a singular value matrix decomposition (SVD) on said received signals; and
>
> transmitting said coefficients as feedback information to said base station, via one or more uplink RF channels.

In order to properly consider the meaning of this term, some background information regarding the communication channel is necessary. The specification explains that an RF channel between a transmitting mobile terminal and a receiving mobile terminal may be represented by a transfer system function, H. The specification further describes different variables relevant to signal transmission in the system:

> The relationship between a time varying transmitted signal, X(t), a time varying received signal, y(t), and the systems function may be represented as shown in equation [1]:
>
> *y(t)=Hxx(t)+n(t),*
>
> where n(t) represents noise…introduced as the signal travels through the communications medium and the receiver itself.

(Ex. G, '450 Patent at 3:53–4:9.)

The specification further notes that "[i]n MIMO systems, the elements in equation 1 may be represented as vectors and matrices." (*See* Ex. G, '450 Patent at 3:65–66.) Because signal strength is subject to fading effects that might vary with time, the transfer system function H may itself become time-varying and may thus also become a function of time, H(t). Therefore, individual coefficients (or multipliers), $h_{ij}(t)$, in the transfer function H(t) may become time varying in nature. (*See* Ex. G, '450 Patent at 4:6–9.) These variables become important in MIMO systems operating according to the IEEE's 802.11 standard because in such systems "the receiving mobile terminal may compute H(t) each time a frame of information is received from a transmitting mobile terminal based upon the contents of a preamble field in each frame." (*See* Ex. G, '450 Patent at 4:10–14.) The "preamble field" is a signal to used to synchronize and facilitate data transmission.

In this context, the specification describes the meaning of the disputed term "channel estimate matrix." It notes that "[t]he computations which are performed at the receiving mobile terminal may constitute ***an estimate of the 'true' values of H(t) and may be known as 'channel estimates'…***To the extent that ***H(t), which may be***

referred to as the "channel estimate matrix", changes with time and to the extent that the transmitting mobile terminal fails to adapt to those changes, information loss between the transmitting mobile terminal and the receiving mobile terminal may result." (*See* Ex. G, '450 Patent at 4:14–24 (emphasis added).) Thus, the patentees twice link the term "channel estimate matrix" to the time-varying transfer system function "H(t)." *See Phillips*, 415 F.3d at 1315 ("[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'") (*quoting Vitronics*, 90 F.3d at 1582).

Turning to the claim language, the method requires computing one or more channel estimate matrices from signals received by a wireless communication device from a base station. The claim language requires that a plurality of channel estimate matrices comprise "coefficients derived from performing singular value decomposition (SVD)" on the RF signals received by the wireless communication device from the base station. (*See* Ex. G, '450 Patent at 19:13–19.) The coefficients of H(t) resulting from SVD are then transmitted back to the base station. By doing so, the wireless communication device can feedback channel information in a compressed format that the base station can use to adjust or attenuate signal strength as necessary to improve performance; for example, by reducing noise. *See Phillips*, 415 F.3d at 1314 ("the claims themselves provide substantial guidance as to the meaning of particular claim terms.").

After reviewing the specification and claim language, Dr. Madisetti explains:

> [T]he method requires computing one or more channel estimate matrices, H(t) from signals received by a wireless communication device from a base station. The claim language goes on to explain that a plurality of channel estimate matrices are comprised of coefficients derived from performing SVD on the RF signals received by the wireless communication device from the base station. These SVD coefficients of H(T) are then transmitted back to the base station. By doing so, the wireless communication device can feedback channel information

> in a compressed format that the base station can use to adjust or attenuate signal strength as necessary to improve performance, for example by reducing noise.

(Ex. L, Madisetti Op. Decl. ¶ 139.) Dr. Madisetti goes on to opine that a "POSITA would understand the term 'channel estimate matrices/matrices based on the plurality of channel estimates' to mean 'one or more matrices that is based on an SVD decomposition of the estimates of the values of H(t).'" (Ex. L, Madisetti Op. Decl. ¶ 140.) *See Phillips*, 415 F.3d at 1318 ("[E]xtrinsic evidence in the form of expert testimony can be useful to a court for a variety of purposes, such as to provide background on the technology at issue, to explain how an invention works, to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field.").

BNR's proposed construction aligns with the claim language, the teachings of the specification, and the understanding of a POSITA and should be adopted. Even Defendants' expert, Dr. Min, acknowledges that "the '450 Patent consistently refers to "channel estimate matrix" as a matrix H….Similarly, the claim term 'matrix based on the/said plurality of channel estimates' must also refer to a matrix H." (Ex. O, Min Op. Decl. ¶ 148.)

On the other hand, Defendant's construction violates a fundamental tenet of patent law: importing limitations from an embodiment into the claims. *See Retractable Techs., Inc. v. Becton*, 653 F.3d 1296, 1313 (Fed. Cir. 2011) ("It is improper to import limitations from the specification into the claims, and this court has expressly and repeatedly warned against confining claims to specific embodiments of the invention set forth in the specification.").

The specification describes several different channel estimate embodiments:

> In one embodiment of the invention, a receiving mobile terminal may periodically transmit feedback information, comprising a **channel estimate matrix, $\mathbf{H_{up}}$,** to a

> transmitting mobile terminal. In another embodiment of the invention, a receiving mobile terminal may perform a singular value decomposition (SVD) on the channel estimate matrix, and subsequently transmit SVD-derived feedback information to the transmitting mobile terminal.

(Ex. G, '450 Patent at 7:64–8:5 (emphasis added).)

> **Yet another embodiment of the invention** may expand upon the method utilizing sounding frames to incorporate calibration. In this aspect of the invention, a receiving mobile terminal, after transmitting a sounding frame, may subsequently receive a **channel estimate matrix, $\mathbf{H_{down}}$,** from the transmitting mobile terminal. The receiving mobile terminal may then transmit feedback information which is based upon the difference H_{up}-H_{down}, to the transmitting mobile terminal.

(Ex. G, '450 Patent at 8:10–18 (emphasis added).)

> **In one embodiment of the invention**, **a full channel estimate matrix** which is computed by a receiving mobile terminal, $\mathbf{H_{est}}$**,** may be represented by its SVD: $H_{est}=USV^H$, where equation[2] H_{est} may be a complex matrix of dimensions N_{rx} x N_{tx}, where N_{rx} may be equal to the number of receive antenna at the receiving mobile terminal, and N_{tx} may be equal to the number of transmit antenna at the transmitting mobile terminal, U may be an orthonormal complex matrix of dimensions N_{rx} N_{rx}, S may be a diagonal real matrix of dimensions N_{rx} x N_{tx}, and V may be an orthonormal complex matrix of dimensions N_{tx} x N_{tx} with V^H being the Hermitian transform of the matrix V.

(Ex. G, '450 Patent at 8:52–65 (emphasis added).)

Defendants' construction is derived from the last embodiment describing H_{est}, but the specification explicitly states that this is merely "one embodiment of the invention" and there is nothing in the claim language that justifies limiting the claims to the H_{est} embodiment. *See Kara Tech. Inc. v. Stamps.com Inc.*, 582 F.3d 1341, 1348 (Fed. Cir. 2009) ([T]he patentee is generally "entitled to the full scope of his claims, and we will not limit him to his preferred embodiment or import a limitation from the specification into the claims." (citing *Phillips*, 415 F.3d at 1323)); *Liebel-Flarsheim*, 358 F.3d at 906 ("This court has expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment."). Defendants' expert, Dr. Min, acknowledges that the use of H_{est} is disclosed as "an embodiment of the invention utilizing singular value decomposition…" (Ex. O, Min Op. Decl. ¶ 146.)

Additionally, dependent Claim 2 of the '450 Patent adds the limitation "computing each of said plurality of channel estimate matrices for a corresponding **one of a plurality of tones**, wherein each of said plurality of tones corresponds to **one or more distinct frequencies**." (Ex. G, '450 Patent at 19:23–27 (emphasis added).) Thus, the "for tones of different frequencies" limitation in Defendants' proposed construction is improper for violating the doctrine of claim differentiation. *See Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1380 (Fed. Cir. 2006) ("In the most specific sense, "claim differentiation" refers to the presumption that an independent claim should not be construed as requiring a limitation added by a dependent claim.").

The Court should adopt BNR's proposed definition because it is consistent with the plain and ordinary meaning, the claim language, descriptions in the specification, and the opinions of persons of ordinary skill in the art. Defendants' construction inappropriately imports limitations from a specific embodiment described in the specification and another embodiment claimed in a dependent claim, contrary to basic principles of claim construction.

D. "coefficients derived from performing a singular value matrix decomposition (SVD)"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
Plain and ordinary meaning. In the alternative, to the extent the Court determines that a specific	"values in the matrices U, S, or V^H, where $H_{est}=USV^H$"

construction is warranted, BNR proposes: "values derived from a singular value decomposition"	

The term in question is highlighted below in Claim 1 of the '450 Patent:

1. A method for communication, the method comprising:

> computing a plurality of channel estimate matrices based on signals received by a mobile terminal from a base station, via one or more downlink RF channels, wherein said plurality of channel estimate matrices comprise **coefficients derived from performing a singular value matrix decomposition (SVD)** on said received signals; and transmitting said coefficients as feedback information to said base station, via one or more uplink RF channels

Singular Value Decomposition ("SVD") is a well-known matrix decomposition method for reducing a matrix to its constituent parts to make certain subsequent matrix calculations easier. (Ex. L, Madisetti Op. Decl. ¶ 138.) The specification describes that "SVD is a method which may reduce the quantity of channel feedback information which is transmitted between a receiving mobile terminal and a transmitting mobile terminal." (Ex. G, '450 Patent at 8:45–47.)

In the context of the H_{est} embodiment, the patentees provide an example of an SVD operation:

> In one embodiment of the invention, a full channel estimate matrix which is computed by a receiving mobile terminal. H_{est} may be represented by its SVD:
>
> $H_{est}=USV^H$, where
>
> H_{est} may be a complex matrix of dimensions N_{rx} x N_{tx}, where N_{rx}, may be equal to the number of receive antenna at the receiving mobile terminal, and N_{tx} may be equal to the number of transmit antenna at the transmitting mobile terminal, U may be an orthonormal complex matrix of dimensions N_{rx}-N_{rx}, S may be a diagonal real matrix of

> dimensions N_{rx} x N_{tx}, and V may be an orthonormal complex matrix of dimensions N_{tx} x N N_{tx}, with V^H being the Hermitian transform of the matrix V.

(Ex. G, '450 Patent at 8:52–65.) The computed matrices U, S, and V^H, contain coefficients. (*See*, for example, Ex. G, '450 Patent at 9:37–42.) According to the claim language, these coefficients are transmitted back to the base station. (Ex. G, '450 Patent Claim 1 ("transmitting said coefficients as feedback information to said base station").) But this is just one embodiment of the invention, as explicitly stated in the excerpt above.

BNR's proposed construction accurately reflects the plain claim language and should be adopted. *See Renishaw*, 158 F.3d at 1250 ("The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction."). Furthermore, BNR's construction conforms to Dr. Madisetti's understanding of this term based on the perspective of a POSITA:

> [T]he structure of the claim dictates that SVD must be performed on the wireless signals received by a wireless device from a base station. The SVD will result in a decomposition of the estimates of the values of H(t). The coefficients derived from the SVD operation will then be transmitted back to the base station.
>
> Therefore, it is my opinion that a POSITA would understand the term "coefficients derived from performing a singular value matrix decomposition (SVD)" to mean "values derived from a singular value decomposition."

(Ex. L, Madisetti Op. Decl. ¶¶ 150–151.)

Defendants' construction is flawed because it requires that the coefficients be from the H_{est} matrix—only one embodiment of the invention. This error flows directly from Defendants' proposed construction of "channel estimate matrices," which also impermissibly limits the "channel matrices" term to H_{est}. However, as discussed above,

H_{est} is a preferred embodiment that Defendants have improperly imported into the claims, and their proposed construction for this disputed term should be rejected for the same reasons enumerated above.

VII. CLAIM CONSTRUCTION REGARDING U.S. PATENT NO. 6,941,156

A. Background of the Invention

The ’156 Patent is entitled “Automatic Handoff for Wireless Piconet Multimode Cell Phone” and claims priority to a date no later than June 2001. The ’156 Patent is generally related to the use of multimode cellular phones and the ability to smoothly switch between two different modes of communication operable on the cellular phone, such as a cellular connection and another RF connection (like WiFi). The claimed inventions in the ’156 Patent are directed to improved methods of switching between the modes of operation. One of the important technical advantages and improvements offered by the invention is a multimode cell phone capable of automatic switching, including establishing a second communications link while the first communications link is still active. The prior art required the call to disconnect before switching modes or for a second to be initiated by an intermediary instead of the claimed multimode cell phone.

B. “simultaneous communication paths from said multimode cell phone”

Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
Plain and ordinary meaning. In the alternative, to the extent the Court determines that a specific construction is warranted, BNR proposes: “two or more active links at the same time from said multimode cellphone”	“at least two established distinct and different communication links from said multimode cell phone to a far-end communication device, at the same time”

The term “simultaneous communication paths from said multimode cell phone” appears in Claim 1 of the ’156 Patent (bolded in text):

1. A multimode cell phone, comprising:

a cell phone functionality; and

> an RF communication functionality separate from said cell phone functionality;
>
> a module to establish ***simultaneous communication paths from said multimode cell phone*** using both said cell phone functionality and said RF communication functionality; and
>
> an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality.

(Ex. H, '156 Patent at 8:15–31.)

BNR's proposed definition, in addition to reflecting the plain and ordinary meaning, is consistent with and supported by the intrinsic record. The meaning is confirmed by the opinions of Dr. Madisetti, viewing the claim language through the eyes of a person of ordinary skill in the art. In contrast, Defendants' construction is flawed because it violates fundamental tenets of claim construction regarding importing limitations that either exist in other elements of the claim or are unsupported by the intrinsic record.

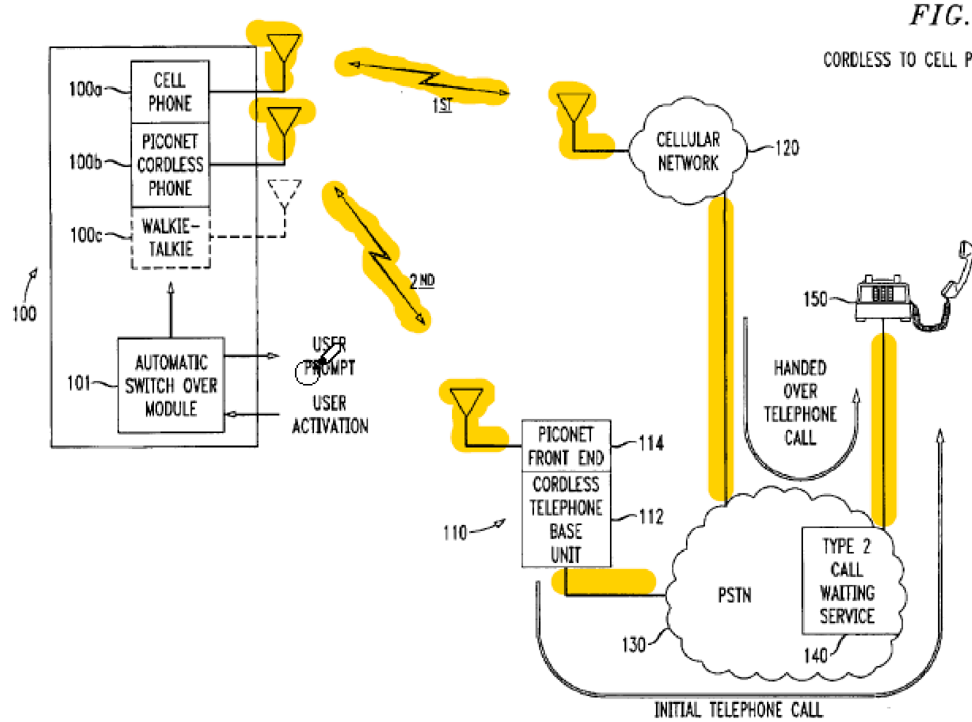
First, the claim language focuses on the capabilities of the claimed multimode cell phone, not the telecommunications network or the far-end device—neither of which is referenced in the claim. Claim 1 describes a multimode cell phone with two communication functionalities: cellular and an RF separate from cellular. It then describes a module to establish the simultaneous communication paths using both of those communication functionalities, cellular and RF, that are resident on the claimed multimode cell phone. Finally, it claims an automatic switchover module within the multimode cell phone that switches between "a communication path established ***on***

one of said cell phone functionality and said RF communication functionality " and "another communication path later established ***on the other of said cell phone functionality and said RF communication functionality***." (*See* Ex. H, '156 Patent Claim 1 (emphasis added).) That is, the claimed modules act on the functionalities that are a part of the claimed multimode cell phone. The focus of the claim language is on the multimode cell phone, and does not address the telecommunication network or the far-end device.

The specification also confirms BNR's construction. Figure 1 is particularly instructive in that the links are identified with respect to the *multimode cell phone*, and not with respect to the far end device:

FIG. 1

CORDLESS TO CELL PHONE HAND OVER



(Ex. H, '156 Patent at Fig. 1 (highlights added).) Figure 1 shows the two communication paths for (a) a cell phone functionality (as shown by 100a, the antenna diagram, following through to the path identified as "1st" to the cellular network 120) and (b) a second RF communication functionality other than cell phone functionality (as shown by 100b, the related antenna diagram, following through to the path identified as "2nd" to the piconet front end 114 and cordless telephone base unit 112). (*See* Ex. L, Madisetti Op. Decl. ¶ 51; Ex. M, Madisetti Rebuttal Decl. ¶ 14.) But both of these paths are depicted in the claimed multimode cell phone. Figure 1 thus discloses two links from the multimode cell phone that flow to the PSTN 130. From the PSTN 130 to the far end device 150, there is only *one link*. For Defendants' construction to be correct, there would have to be two.

Further, additional portions of the specification support BNR's construction. Under Defendants' construction, there must be two concurrent paths, each of a different mode, that extend all the way to the far end device—that is, the far end device would be required to have the same mode capabilities as the multimode cell phone. But the specification unambiguously rejects that argument; the far end device "can be any telephonic device, multi-mode or ***single mode***." (Ex. H, '156 Patent at 4:12–17 (emphasis added).) Defendants' construction thus contradicts the specification. *See Phillips*, 415 F.3d at 1313 ("[C]laims must be construed so as to be consistent with the specification.").

BNR's position is also consistent with statements made during the prosecution of the application that led to the '156 Patent. To overcome a prior art rejection over U.S. Patent 5,842,122 to Schellinger et al. ("Schellinger"), the patentee amended the claims to include the limitation "a module to establish simultaneous communication paths from a multimode cell phone using both a cell phone functionality and RF communication functionality." (*See* Ex. I at Appx299, Jan. 6, 2005 Response to Office Action at p. 7; *see also id.* at Appx294–98 (pp. 2–6).) In explaining how this claim amendment traversed the Examiner's rejection, the patentee stated as follows:

> However, according to Schellinger, **automatic forwarding** systems **of a central office** are implemented to allow handoff of a call. See, e.g., col. 6, lines 12-15; and col. 6, line 24 (remote call forwarding performed). As explained by Schellinger at col. 7, lines 50-62, a call in process is handed off by producing a THREE WAY CALL **through the cellular telephone system** (i.e., NOT through the cell phone itself). To finally implement the handoff, the cell phone switches to a landline leg of a **three way call** (set up by a central office and/or cellular telephone system), and the initial call is dropped.
>
> The present invention requires a module to establish **simultaneous communication paths from a multimode cell phone** using both a cell phone functionality and RF communication functionality, or to establish **from a multimode cell phone** a second type RF communication link while a first type RF communication link **remains active** at the multimode cell phone. Schellinger fails to disclose simultaneous communication paths from a multimode cell phone as claimed by the claims of the present application.

(*See* Ex. I at Appx300, Jan. 6, 2005 Response to Office Action at p. 8 (highlights added).) According to the patentee, Schellinger disclosed a communication path "produced . . . through the cellular telephone system" or "set up by a central office and/or cellular telephone system." *See id.* By adding the limitation for a module on the multimode cell phone that establishes the communication paths, the patentee was stating that the patentable distinction is that the claimed multimode cell phone establishes the communication path, and not some external network or function. *See Phillips*, 415 F.3d at 1317 ("[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention . . . .").

Further, Defendants' expert, Dr. Paul Min, acknowledged during deposition that the Schellinger reference discloses a communication system where the multimode cell phone *does not initiate* the three-way call (i.e., the second communication path). Dr. Min was asked to refer to an excerpt cited in his declaration from Schellinger, which stated "In Fig. 6–2 the cordless base station 115 . . . answers the landline leg of the three way call . . . to open communication between the other party and the cordless base station 115." (*See* Ex. P, Min Dep. at 57:18–23 (referencing Ex. O, Min Op. Decl. ¶ 88).) Dr. Min testified:

> **Q.** So if the cordless base station answers the landline, then it did not initiate that communication path, correct?
> **A.** That's what it says here. I mean, in this particular paragraph.
> **Q.** It says that it did not initiate the communication path?
> **A.** That's right. It answers the landline leg of the three-way call.

(*See* Ex. P, Min Dep. at 57:24–58:16.) Therefore, Schellinger discloses a second communication path initiated by the telephone system and not the multimode cell phone. This distinction was sufficient to overcome the Examiner's rejection, and the Examiner issued a Notice of Allowance. A person of skill in the art, reading the prosecution history would likewise understand that the distinction between Schellinger and the '156 Patent is that the claimed multimode cell phone, instead of an off-device system, establishes the second communication path. (*See* Ex. M, Madisetti Rebuttal Decl. ¶ 13.)

Defendants' construction is flawed for additional reasons. First, Defendants' use of the phrase "established distinct and different communication links" is confusing. In fact, during deposition, Dr. Min struggled to even define the phrase. (*See* Ex. P, Min Dep. at 35:6–42:4.) Dr. Min states that "[distinct and different] both indicate that these two communications links are not the same, but perhaps distinct has a more characterized nature of communication link versus different could be, maybe the path itself the link, the path itself is different" where "characterized" could mean that " you could use a different technology for example. So the claim, say it's a multimode cell phone. So it may describe the mode being different. And different, just using different by itself could say, I mean, you could use a different path, physical path, but maybe use the same mode." (*See* Ex. P, Min Dep. at 37:18–38:17.)

To the extent Defendants' proposed construction "different and distinct" means a different physical path and a distinct mode, these limitations are captured by the surrounding claim language, rendering Defendants' construction improper. Claim 1, in the same limitation as the term for construction, and just after it, states "using ***both*** said cell phone functionality and said RF communication functionality." (Ex. H, '156 Patent at Claim 1.) Claim 1 also expressly states that the RF communication functionality is "separate from said cell phone functionality." *See id.* Thus, the claim already requires that each communication path utilize a different mode. For the same reason, the communication paths are necessarily different: one will start at the multimode cell phone and transit to the cell phone network and the other will start at the multimode cell phone and transit to the base station for the other RF communication. As a result, Defendants' use of the terms "distinct and different" are at best, redundant, and at worst, likely to cause even more confusion for the jury and uncertainty during the litigation. *See Digital-Vending Servs., Int'l, LLC v. Univ. of* Phoenix, Inc., 672 F.3d 1270, 1275 (Fed. Cir. 2012) (It is important to construe "claim terms in light of the surrounding claim language, such that words in a claim are not rendered superfluous.").

Defendants' construction adds an additional unsupported limitation that the "established distinct and different communication links from said multimode cell phone" extend all the way to "a far-end communication device." As explained above, not only is this limitation nonexistent in the claim or specification, the intrinsic record repudiates such a requirement. (Ex. H, '156 Patent at 4:12–17 (far-end device "can be any telephonic device, multi-mode or ***single mode***") (emphasis added).) Defendants' construction also would require "distinct and different" paths—that is, paths using different modes and along different physical paths—all the way to the far-end device. A single mode telephonic device simply cannot maintain two established communication paths using two modes; it is a technical impossibility. (*See* Ex. L, Madisetti Op. Decl. ¶¶ 51–52.) This reading is further supported by reference to Fig. 1, as shown above, that clearly identifies only one link (the solid line from PSTN 130 to far-end device 150).

To the extent the Court deems construction of the term "simultaneous communication paths from said multimode cell phone" is necessary, the Court should adopt BNR's proposal because it is well supported by the intrinsic evidence. Defendants' construction, on the other hand, injects confusion and violates fundamental claim construction jurisprudence because it contradicts the specification.

C. "a module to establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality"

Plaintiff's Proposed Construction	Huawei & Coolpad's Proposed Construction[4]
Not a 112 ¶ 6 claim element – In the alternative, to the extent the Court determines that this claim is governed by 112 ¶ 6, BNR proposes the following Function and Structure, and disagrees that the term is indefinite for lack of corresponding structure: <u>Function</u>: establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality <u>Structure</u>: Corresponding structure for the alleged function exists in at least the following portions of the patent specification, or their equivalents:	This is a 112 ¶ 6 claim element. <u>Function</u>: "establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality" <u>Structure</u>: Fig. 1 (element 101); Fig. 2 steps 202-208; Fig. 4 steps 402-408; 4:50-67; 7:1-16.

[4] BNR understands from the parties claim construction exchanges and submissions to the Court that Kyocera and ZTE do not join in this proposal.

Figs. 1, 3, Col. 3:48–4:49; 4:54–5:62; 6:3–55; 6:60–8:5	

The term "a module to establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality" appears in Claim 1 of the '156 Patent:

> 1. A multimode cell phone, comprising:
>
> a cell phone functionality; and
>
> an RF communication functionality separate from said cell phone functionality;
>
> ***a module to establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality***; and
>
> an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality.

(Ex. H, '156 Patent Claim 1.)

The term "a module to establish simultaneous communication paths from said multimode cellphone using both said cell phone functionality and said RF communication functionality" is not a means-plus-function term because the limitation connotes sufficiently definite structure to a person of ordinary skill in the art. However, to the extent the Court determines that § 112, ¶ 6[5] applies, Huawei and Coolpad's proposed structure is too narrow in view of the broader language in the specification.

1. <u>The "module to establish simultaneous communications" term is not governed by § 112, ¶ 6.</u>

[5] The '156 Patent was filed on June 26, 2001 and therefore pre-AIA.

There is no presumption that a means-plus-function reading is warranted for this term, and the intrinsic and extrinsic evidence demonstrates that the claim itself recites sufficiently definite structure. Where a limitation does not use the word "means," "there is a rebuttable presumption that § 112, ¶ 6 does not apply." *See TEK Global, S.R.L. v. Sealant Sys. Int'l*, 920 F.3d 777, 786 (Fed. Cir. Mar. 29, 2019). Only "if the challenger demonstrates that the claim term fails to recite sufficiently definite structure," can the rebuttable presumption be overcome. *See id.* (quoting *Williamson v. Citrix Online, LLC,* 792 F.3d 1339, 1349 (Fed. Cir. 2015)). Specifically with respect to a term including the word "module," courts in this district have made clear that "*Williamson* does not . . . stand for the broad proposition that the term 'module' automatically places it among terms such as 'means' and 'step for,' thus triggering a presumption that [§ 112, ¶ 6] applies." *Blast Motion*, 2017 U.S. Dist. LEXIS 16549 at *45–46. Instead, even if the claim term uses the term module, there is still the rebuttable presumption that § 112, ¶ 6 does not apply. *See id.* at *45–46. Defendants have failed to overcome this presumption; the term recites more than sufficiently definite structure.

"Paragraph 6 does not apply when 'the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure. . . . To determine whether the claim limitation at issue connotes sufficiently definite structure to a person of ordinary skill in the art, we look first to intrinsic evidence, and then, if necessary, to the extrinsic evidence." *TEK Global*, 920 F.3d at 786; *Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1372 (Fed. Cir. 2015) ("In undertaking this analysis, we ask if the claim language, read in light of the specification, recites sufficiently definite structure to avoid § 112, ¶ 6.") (quoting *Robert Bosch, LLC v. Snap-On Inc.*, 769 F.3d 1094, 1099 (Fed. Cir. 2014)); *see also Blast Motion*, 2017 U.S. Dist. LEXIS 16549, at *9, 47 ((stating same and conducting an analysis that looked to whether the claims, in light of the specification, recites sufficiently definite structure). Here, the claim language and the specification confirm that the limitation connotes sufficient structure.

First, the claim language itself connotes sufficiently definite structure to a person of ordinary skill in the art. Claim 1 claims "A ***multimode cell phone comprising*** . . . a module to establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality." (Ex. H, '156 Patent Claim 1.) That is, this module to establish simultaneous communication paths ***is a part of the*** multimode cell phone. And a person of skill in the art understood what a multimode cell phone was at the time of the invention and the inner circuitry and specialized software for the multimode cellphone. (*See* Ex. O, Min Op. Decl. ¶ 100) ("A POSITA would understand that multimode cell phone 100 described by the '156 Patent must include radio communication equipment (e.g. antenna, amplifier, transmitter, receiver, etc.) operating in conjunction with a general purpose computer (e.g. microprocessor) that is specially programmed to perform wireless communications, typical in compliance with telecommunication industry standards (e.g. 3GPP/ETSI, etc)"); (Ex. P, Min Dep. at 46:2–4 ("So at the time 2000, let's say earlier date of the two possible priority date, 2000. People knew what the cell phone was.").) Thus, a person of skill in the art at the time of the invention would understand that the module to establish simultaneous communication paths refers to the hardware and specialized software that manages the transmission and receiving for each of the modes in accordance with the relevant standards, often the integrated system on a chip or the baseband processors. (*See* Ex. L, Madisetti Op. Decl. ¶¶ 59–60.)

Second, the specification supports this reading of the claim. As shown above in Fig. 1, the separate communication functionalities are located within the multimode cell phone. (Ex. H, '156 Patent at Fig. 1.) And the specification particularly references cell phone functionality 100a and RF communication functionality 100b, which a person of skill in the art would readily understand to mean the requisite hardware and software, including transceivers, operating in accordance with the relevant telecommunications standards. (*See* Ex. H, '156 Patent at 3:52–55; Ex. L, Madisetti Op. Decl. ¶¶ 58–59.) *See TEK Global*, 920 F.3d at 786.

2. <u>If the Court determines that the presumption has been rebutted, and § 112, ¶ 6 applies, Defendants' disclosed structure is improperly narrow.</u>

Assuming that § 112, ¶ 6 applies to this limitation (which it should not), then construing the term requires two steps: determining the claimed function and identifying the corresponding structure in the written description of the patent that performs the function. *See Blast Motion*, 2017 U.S. Dist. LEXIS 16549, at *10. "When multiple embodiments in the specification correspond to the claimed function, proper application of § 112 P 6 generally reads the claim element to embrace each of those embodiments." *Micro Chem, Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258–59 (Fed. Cir. 1999); *Serrano v. Telular Corp*., 111 F.3d 1578, 1583 (Fed. Cir. 1997). Finally, in construing a term subject to § 112, ¶ 6, the claim "shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." *See Bal Seal Eng'g Co. v. Qiang Huang*, No. 10cv819-CAB, 2011 U.S. Dist. LEXIS 84516, at *4 (S.D. Cal. Aug. 1, 2011).

As an initial matter, there is no dispute with regard to the alleged function (if § 112, ¶ 6 applies). The function is to "establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality."

BNR contends that the structures that correspond with this function are disclosed in Figure 1, including 100a and 100b, as well as Col. 3:52–55, 3:64–4:1, 4:12–23, 5:27–32, 6:3–8, and 6: 33–40. As Dr. Madisetti opined, these portions of the specification show that there is circuitry, including hardware and software for the multimode cell phone 100 in Figure 1, including the transceivers and related hardware and software components of 100a and 100b of multimode cell phone 100, which describes the inputs and outputs, and where information travels next. (*See* Ex. L, Madisetti Op. Decl. ¶¶ 58, 59, 63) For example, in Col. 3:60–4:27, the specification teaches that the module to establish simultaneous communication paths is first controlled through suitable communications with each communication path functionality 100a–100c. Where a communication path may be dropped, another mode is activated and establishes a communication link while the first remains active. (*See* Ex. H, ’156 Patent at 3:60–4:27.) Further, the specification identifies steps where the user may be prompted about impending loss of the signal and or prompted to permit establishment of the alternate communication path. (*See* Ex. H, ’156 Patent at 4:41–44.) Thus, it is clear that the multimode cell phone 100, and the cell phone functionality 100a and RF communication functionality 100b, which are readily understood to a person of skill in the art as RF transceivers operating in accordance with their respective telecommunications standards and using hardware and software, where the steps of setting up a first communication path, awaiting indication of the need for a second, simultaneous communication path, and then, third establishing a the second communication path are implemented within the multimode cell phone 100 and the elements 100a and 100b.

Huawei and Coolpad’s proposed structure incorrectly narrows the relevant structure to just two embodiments, those disclosed in Fig. 1 (element 101) and in Fig. 2, steps 202-208; Fig. 4 steps 402-408 as well as the corresponding specification description at Col. 4:50–67 and 7:1–16. These figures represent particular embodiments, do not include the structure that captures all potential embodiments, as discussed above. In doing so, Defendants capture only an “exemplary process” (Col. 4:50; Col. 7:1). *See Micro Chem*, 194 F.3d at 1258–59; *Serrano*, 111 F.3d at 1583 (declining to require “overly limiting structure” that is “contrary to the statement of multiple structures disclosed in the specification” and noting that “[d]isclosed structure includes that which is described in a patent specification, including any alternative structures identified.”).

D. "an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality"

Plaintiff's Proposed Construction	Huawei & Coolpad's Proposed Construction
Not a 112 ¶ 6 claim element In the alternative, to the extent the Court determines that this claim is governed by 112 ¶ 6, BNR proposes the following Function and Structure, and disagrees that the term is indefinite for lack of corresponding structure: <u>Function:</u> in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality <u>Structure</u>: Corresponding structure for the alleged function exists in at least the following portions of the patent specification, or their equivalents: Figs. 1, 3, Col. 3:48–4:49; 4:54–5:62; 6:3–55; 6:60–8:5	This is a 112 ¶ 6 claim element. <u>Function</u>: "automatic switch over of a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality" <u>Structure</u>: Fig. 1 (element 101); Fig. 2 steps 210-212; Fig. 4 steps 410-412; 5:1-7; 7:17-26, Claim 1 ("an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality").

The term "an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality" appears in Claim 1 of the '156 Patent:

> A multimode cell phone, comprising:
>
> a cell phone functionality; and
>
> an RF communication functionality separate from said cell phone functionality;
>
> a module to establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality; and
>
> ***an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality.***

(*See* Ex. H, '156 Patent at Claim 1.)

The term "an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality" is not a means-plus-function term because the limitation connotes sufficiently definite structure to a person of ordinary skill in the art. However, to the extent the Court determines that § 112, ¶ 6[6] applies, Huawei and Coolpad's proposed structure is too narrow in view of the broader language in the specification.

1. The "automatic switch over module" term is not governed by § 112, ¶ 6.

[6] The '156 Patent was filed on June 26, 2001 and therefore pre-AIA.

There is no presumption that a means-plus-function reading is warranted for this term, and the intrinsic and extrinsic evidence demonstrate that the claim itself recites sufficiently definite structure. Where a limitation does not use the word "means," "there is a rebuttable presumption that § 112, ¶ 6 does not apply." *See TEK Global*, 920 F.3d at 786. Only "if the challenger demonstrates that the claim term fails to recite sufficiently definite structure," can the rebuttable presumption be overcome. *See id.* (quoting *Williamson*, 792 F.3d at 1349). While the term module be a well-known nonce word, this Court has made clear that "*Williamson* does not . . . stand for the broad proposition that the term 'module' automatically places it among terms such as 'means' and 'step for,' thus triggering a presumption that [§ 112, ¶ 6] applies." *See Blast Motion*, 2017 U.S. Dist. LEXIS 16549, at *45–46. Instead, even if the claim term uses the term module, there is still the rebuttable presumption that § 112, ¶ 6 does not apply. *See id.* at *45–46. Defendants have failed to meet their burden; the term recites more than sufficiently definite structure.

"Paragraph 6 does not apply when 'the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure. . . . To determine whether the claim limitation at issue connotes sufficiently definite structure to a person of ordinary skill in the art, we look first to intrinsic evidence, and then, if necessary, to the extrinsic evidence." *TEK Global*, 920 F.3d at 786; *Media Rights*, 800 F.3d at 1372 ("In undertaking this analysis, we ask if the claim language, read in light of the specification, recites sufficiently definite structure to avoid § 112, ¶ 6.") (quoting *Robert Bosch*, 769 F.3d at 1099); *see also Blast Motion*, 2017 U.S. Dist. LEXIS 16549, at *9, 47 (stating same and conducting an analysis that looked to whether the claims, in light of the specification, recites sufficiently definite structure). Further, sufficient structure "may be provided by describing the claim limitation's operation, such as its input, output, or connections." *See Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1299 (Fed. Cir. 2014). Here, the claim language and the specification confirm that the limitation connotes sufficient structure.

As with the prior term, the claim language itself connotes sufficiently definite structure to a person of ordinary skill in the art. Claim 1 claims "A ***multimode cell phone comprising*** . . . an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality." The automatic switch over module is ***a part of*** the multimode cell phone, itself.

Further, this limitation is described by its operation and includes its inputs and outputs in the claim language. The automatic switch over module is in communication with both said cell phone functionality and said RF communication functionality. Further, it is operable to switch, or route, a communication path from the cell phone functionality to the RF communication functionality or in reverse. A person of ordinary skill in the art at the time of the invention would share that understanding. (*See* Ex. M, Madisetti Rebuttal Decl. ¶ 41.)

These connections to the cell phone functionality and the RF communication functionality within the multimode cell phone connote sufficient structure in the claim itself such that the presumption against § 112, ¶ 6 is not overcome. Indeed, even Huawei and Coolpad identify a portion of the claim limitation to be ***structure***:

Huawei & Coolpad's Proposed Construction
Structure: Fig. 1 (element 101); Fig. 2 steps 210-212; Fig. 4 steps 410-412; 5:1-7; 7:17-26, claim 1 ("an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality").

(*See* Doc. No. 63-2 at 53, Appendix B to Joint Hearing Statement) (identifying "an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality").

Looking to the specification also confirms that the limitation connotes sufficient structure because a person of ordinary skill in the art, reading the claims in view of the specification, would understand the term to refer to sufficiently definite structure. Figure 1 identifies inputs of user activation and outputs of user prompt, as well as connection to each of the modes 100a–100c. (*See* Ex. H, '156 Patent at Fig. 1.) The specification further includes an example of such inputs and outputs:

> In accordance with the principles of the present invention, an automated procedure may be initiated by the user of the multimode cell phone 100 at the press of a designated button. The user may be prompted about impending loss of signal or otherwise loss of the established telephone call, and may be prompted to permit establishment of and ultimately transfer to an alternative type communication path (e.g., a cellular phone call). In response, the user preferably activates a suitable button, e.g., a dedicated

> button called, e.g., "Switch to Cell Network", or simply "Switch Communication Path".

(*See* Ex. H, '156 Patent at 4:37–47.) Thus a person of ordinary skill in the art would understand that this automatic switchover module limitation connotes sufficient structure and § 112, ¶ 6 does not apply. *See TEK Global*, 920 F.3d at 786.

2. <u>If the Court determines that the presumption has been rebutted, and § 112, ¶ 6 applies, Defendants' disclosed structure is improperly narrow.</u>

Assuming that § 112, ¶ 6 applies to this limitation (which it should not), then construing the term requires two steps: determining the claimed function and identifying the corresponding structure in the written description of the patent that performs the function. *See Blast Motion*, 2017 U.S. Dist. LEXIS 16549, at *10. "When multiple embodiments in the specification correspond to the claimed function, proper application of § 112 P 6 generally reads the claim element to embrace each of those embodiments." *Micro Chem*, 194 F.3d at 1258–59; *Serrano*, 111 F.3d at 1583. Finally, in construing a term subject to § 112, ¶ 6, the claim "shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." *See Bal Seal*, 2011 U.S. Dist. LEXIS 84516, at *4.

The first dispute centers on the identification of the alleged function. Huawei and Coolpad's alleged function derives from their acknowledgement that "an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality" was adequate *structure*, but attempts to alter the function to just what the automatic switch over module was "operable to" do. (*See* Doc. No. 63-2 at 53, Appendix B to Joint Hearing Statement)

BNR's proposed function, "in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality," which fully encompasses the scope of the claimed module. In contrast, Huawei and Coolpad's alleged function does not explicitly recite the claim language and is instead artificially created; this is improper. "[A] court may not construe a means-plus-function limitation by adopting a function different from that explicitly recited in the claim." *JVW Enters. v. Interact Accessories, Inc.*, 424 F.3d 1324, 1331 (Fed. Cir. 2005) (quoting *Micro Chem.*, 194 F.3d at 1258. (internal quotations omitted)).

This function finds corresponding structure disclosed in Figure 1. "Fig. 1 shows a multimode cell phone handing over a telephone call from a cordless mode to a cellular mode, in accordance with the principles of the present invention." This also includes element 101 of Fig. 1, identified as the automatic switch over module, which is a part of the multimode cell phone 100. The specification further provides:

> A method of automatically switching between a first type RF communication link and a second type RF communication link different from the first type RF communication link, comprising participating in the first type RF communication link. An availability of the second type RF communication link is sensed, and if available, the second type RF communication link is established while the first type RF communication link remains active. The parties participating in the first type RF communication link are switched to active utilization of the second type RF communication link.

(*See* Ex. H, '156 Patent at 1:62–2:4.) This disclosure highlights the algorithm that allows a system to practice the function. First, there is participation in a first type of RF communication link. Next, the second type of RF communication link is sensed and, if available, established while the first type of RF communication link remains active. Then, the switch occurs.

Further elucidation of the structure for this algorithm exists at Col. 4:7–49:

> For explanation purposes, FIG. 1 depicts an established telephone call between the multimode cell phone 100 and a far end telephone 150 (which in the example is a landline

> telephone accessed through a cellular network). Of course, the far end telephone can be any telephonic device, multimode or single mode.
>
> Once the multimode cell phone 100 extends beyond its acceptable range, the telephone call would ordinarily be dropped, perhaps involuntarily. However, in accordance with the principles of the present invention, the telephone call between the multimode cell phone 100 and the far end telephone 150 is automatically re-established using the cellular network 120. By automatically changing the mode of the multimode cell phone 100 (preferably subsequent to a prompt to the user for permission to transfer), the conversation or other communication between the parties is transferred to the newly established cell phone call.

(*See* Ex. H, '156 Patent at 4:12–27.)

The patent then continues to describe examples of switching, including the use of a button or prompt for switching or an automated switch:

> In accordance with the principles of the present invention, an automated procedure may be initiated by the user of the multimode cell phone 100 at the press of a designated button. The user may be prompted about impending loss of signal or otherwise loss of the established telephone call, and may be prompted to permit establishment of and ultimately transfer to an alternative type communication path (e.g., a cellular phone call). In response, the user preferably activates a suitable button, e.g., a dedicated button called, e.g., "Switch to Cell Network", or simply "Switch Communication Path". Of course, the transfer may be entirely automated without requiring input from the user, within the scope of the invention.

(Ex. H, '156 Patent at 4:7–49.) Additional structure for the handover is disclosed in Col. 5:7–62 and 6:3–51, particularly for the step of switching over from one communication link to the other:

> The converse of the example of FIGS. 1 and 2 is also possible. For instance, the multimode cell phone **150** may

> move from a cell phone call to a cordless telephone call, e.g., once the multimode cell phone **100** becomes within range of its matching base unit **110**. In this case, the multimode cell phone **100** automatically establishes a wireless connection with the cordless telephone base station **110** using, e.g., a wireless piconet protocol conforming to the BLUETOOTH™ standard. Using the wireless cordless telephone communication path established between the multimode cell phone **150** and its base unit **110**, a suitable telephone number relating to the far end party may be determined and passed to the cordless telephone functionality of the multimode cell phone **100**.

(*See* Ex. H, ’156 Patent at 5:7–20.)

The ’156 Patent’s discussion of embodiments confirms that the Defendants’ formulation of the structure is too narrow. Restricting merely two examples would result in exclusion of structures handling the automatic switchover functions that are described in the following excerpts from the specification:

- “Preferably, the initial caller in the first telephone call controls the re-establishment of an alternative mode communication path. For instance, in the disclosed embodiment, the far end party's telephone number is obtained by the multimode cell phone **150** that initiated the first telephone call (i.e., who called whom).” (*See* Ex. H, ’156 Patent at 5:21–26.)
- “Telephone numbers for the far end party may be recalled from a last number dialed functionality of the multimode cell phone **150**. However, call related information such as CallerID information may be used to allow a far end party to themselves initiate a communication path mode transfer.” (*See* Ex. H, ’156 Patent at 5:27–32.)
- “In the given example, the cordless telephone base station **110** then goes off hook and dials the telephone number of the far end party, whether or not the far end party initiated the transferred telephone call. In this example, from the far-end user's perspective, the far end user hears that there is a call coming in (e.g.,

using a Call Waiting service) and may or may not review CallerID information such as the telephone number and/or name of the calling party, before they accept the new call. Using Call Waiting type service, the far end party would accept the new communication mode by simply activating a FLASH button and abandoning the first telephone call…To this end, the cordless telephone base unit **110** may notify the handset that the new communication path has been established and accepted, allowing the base unit **110** to finally switch the audio path from the cell phone link to the BLUETOOTH™ cordless telephone link and then disconnect the cell phone call." (*See* Ex. H, '156 Patent at 5:42–62.)

- "The automatic handoff capability may be implemented using a lookup table including entries relating to alternate telephone numbers, e.g., associated cell phone numbers, land line numbers, etc. However, care should be taken to avoid the vulnerability to erroneous communication path switching." (*See* Ex. H, '156 Patent at 6:3–8.)
- "A safer, alternative approach implements a predetermined signaling tone (e g. a DTMF tone sent from the near end (switching) phone and a detector on the far end phone 150 recognizing it and preparing to flash when the new call comes in. Of course, there could be a combination of both. Let's look at this example." (*See* Ex. H, '156 Patent at 6:9–14.)
- "To accomplish [switching], the multimode cell phone 100 may send, e.g., a quick DTMF "7" followed by a DTMF "9" (i.e., representing the characters "SW") notifying the near end user and the far end phone 150 (and user) that a switch is about to happen. The far end phone 150 would remain ready for a switch over for a given length of time, e.g., for 20 seconds. The multimode cell phone 100 makes the alternate phone call as described above. After the far end phone receives the new call, it checks the call related information (e.g., CallerID data) against entries in a suitable lookup table, and if it finds a match, then automatically flashes the telephone line on the original telephone call. The near

end phone, as in the first example, is then notified that the second call has gone through, allowing the conversation to continue on a switched over communication path." (*See* Ex. H, '156 Patent at 6:25–39.)

- "In the unlikely event that the switchover does not succeed, the switchover is preferably delayed (e.g., for 10 seconds or more) to allow the users to switch back to the initial telephone call or communication path." (*See* Ex. H, '156 Patent at 6:40–44.)
- "Similar to the above examples, the multimode cell phone 100 may switch from cordless mode to cell phone mode when the user wishes to leave the proximity of the cordless telephone base unit 110. For instance, manual activation of a suitable button, or automatic detection of the quality of the RF link (e.g., the BLUETOOTH™ piconet link) below a preset level may initiate this feature." (*See* Ex. H, '156 Patent at 45–51.)

Thus, the proper structure is Fig. 1, including element 101, Col. 1:62–2:4, 4:7–49, 5:7–62, and 6:3–51 and equivalents thereof. *See* § 112, ¶ 6.

Huawei and Coolpad's proposed structure, on the other hand, is limited only to "exemplary processes" for alleged function. Specifically, Huawei and Coolpad incorrectly narrow the relevant structure to just two embodiments, those disclosed in Fig. 1 (element 101) and in Fig. 2, steps 202-208; Fig. 4 steps 402-408 as well as the corresponding specification description at Col. 4:50–67 and 7:1-16. In doing so, Huawei and Coolpad capture only two "exemplary process[es]," *see* Col. 4:50; Col. 7:1 and not the full scope of the disclosed structure for all embodiments. *See Micro Chem*, 194 F.3d at 1258–59; *Serrano*, 111 F.3d at 1583 (declining to require "overly limiting structure" that is "contrary to the statement of multiple structures disclosed in the specification" and noting that "[d]isclosed structure includes that which is described in a patent specification, including any alternative structures identified.").

VIII. CLAIM CONSTRUCTION REGARDING U.S. PATENT NO. 7,039,435

A. Background of the Invention

The '435 Patent is entitled "Proximity Regulation System for Use with a Portable Cell Phone and a Method of Operation Thereof," and it issued from an application filed on September 28, 2001.

The '435 Patent generally relates to systems or methods that regulate a mobile device's transmission power to reduce potentially harmful radiation when the device is proximate to a user. The specification describes the potential issue that the patent addresses:

> Typically, the quality of service of a cell phone is proportional to the transmit power level of the cell phone….[H]ealth concerns have arisen due to the power used to transmit the radio frequency of cell phones when operated close to the body of a cell phone user. For example, when held close to the ear, many users have health concerns about the high levels of radio frequency energy causing damage to brain cells.

(*See* Ex. J, '435 Patent at 1:33–41.)

The background section of the '435 Patent describes shortcomings of the prior art:

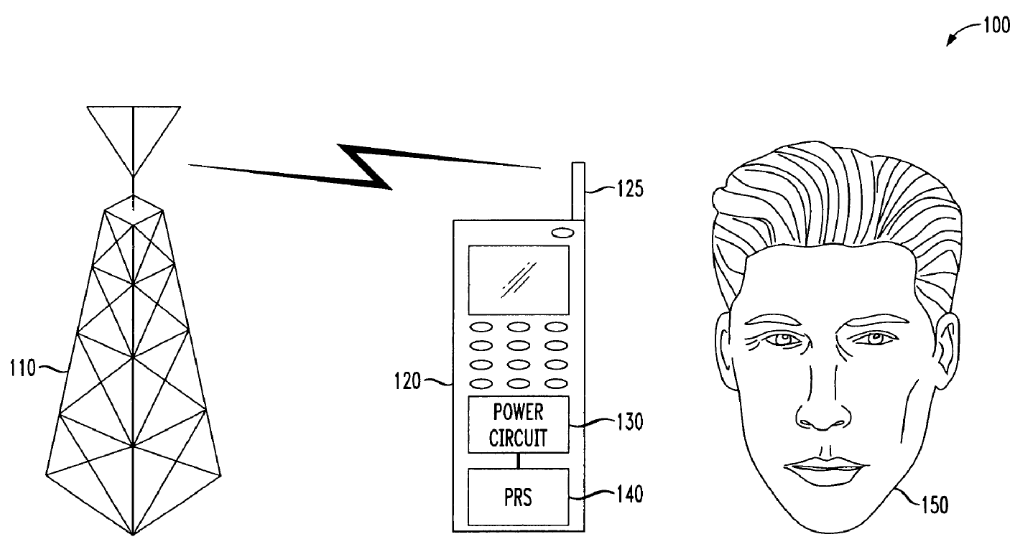
> … [P]ermanently reducing the power of the transmitter in cellphones…also reduces the quality of service of the cell phone. Another option for consumers is the use of cell phones with a base that typically allows a higher transmit power level of up to three watts….These type of cell phones, however, do not allow the flexibility demanded by consumers that is found in the use of a portable cell phone.

(*See* Ex. J, '435 Patent at 1:52–62.)

"Thus, [t]o address the above-discussed deficiencies of the prior art, the present invention provides a proximity regulation system for use with a portable cell phone." (Ex. J, '435 Patent at 2:3–5.) This proximity regulation system, in turn, "includes a location sensing subsystem and a power governing subsystem, which cooperate to determine both the proximity transmit power level and when it may be employed." (Ex. J, '435 Patent at 3:47–51.) The location sensing subsystem determines the location of the cell phone relative to the user, and based on this information, the power governing subsystem, which is coupled to the location sensing subsystem, determines a "proximity transmit power level" of the phone. (Ex. J, '435 Patent at 3:47–51.)

The '435 Patent further discloses a "power circuit" that produces the cell phone's transmission power. (Ex. J, '435 Patent at 3:31–34.) The '435 Patent refers to its Figure 1 and elaborates on the power circuit's function, disclosing that "[t]hrough communications with the communications tower **110** employing the antenna **125**, the power circuit," provides a "network adjusted transmit power level…." (*Id.* at 3:34–37.) The bolded element numbers refer to Figure 1 of the '435 Patent, duplicated below:

FIG. 1



The '435 Patent teaches that the cell phone's transmit power level is ultimately determined, for example, by considering, adjusting, or reducing the network adjusted transmit power level in view of the proximity transmit power level. (*See, e.g.*, Ex. J, '435 Patent at 5:24–36; 7:9–40.)

A. "position to a communications tower"

Plaintiff's Proposed Construction	Huawei's and ZTE's Proposed Construction[7]
"transmit signal strength of a communications path between a communications tower and the portable cell phone"	Plain and ordinary meaning. In the alternative, to the extent the Court determines that a specific construction is warranted, Huawei and ZTE propose: "position of the portable cell phone relative to a communications tower."

The term in question is bolded below in Claim 1 of the '435 Patent:

1. 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.

BNR's proposed construction of the disputed term is dictated by the specification of the '435 Patent, and is supported by additional intrinsic evidence,

[7] Plaintiffs have asserted the '435 Patent against Hauwei and ZTE, but not Coolpad or Kyocera.

including references identified and incorporated into the specification and the prosecution history of the ’435 Patent. BNR’s proposed construction also more completely resolves potentially disputed claim scope by providing meaning to the entirety of the disputed phrase, including the term “position.” Defendant’s proposed construction, on the other hand, leaves unresolved the meaning and scope of “position,” and further introduces the additional term “relative to” that is absent from the ’435 Patent claims and specification and causes confusion as to its meaning, thereby providing less, rather than more clarity regarding the scope of this claim.

As set forth by the claim language immediately above, the “network adjusted transmit power level” is defined within the claim as a function of the disputed phrase “position to a communications tower.” The specification contains three instances describing what the network adjusted transmit power level is a function of.[8] Each of these instances establish that the patentee acted as its own lexicographer and specifically described the patent’s usage of this term. *See Cont’l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 796 (Fed. Cir. 2019) (“Our case law has recognized that the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. When the patentee acts as its own lexicographer, that definition governs. To act as its own lexicographer, a patentee must clearly set forth a definition of the disputed claim term other than its plain and ordinary meaning.”) (internal quotation marks and citations omitted).

The first instance defines the term explicitly:

[8] The ’435 Patent at col. 2:18-20 states “In yet another aspect, the present invention provides a portable cell phone that includes a power circuit as a function of a position to a communications tower and a proximity regulation system.” Although this sentence contains the disputed phrase, this section of the specification does not elaborate on the meaning of the terms is dispute—neither does it mention the term: “network adjusted transmit power,” which immediately precedes the disputed phrase in Claim 1, and which is therefore central to the dispute. Accordingly, the above-identified sentence does not appear relevant to the present claim dispute.

> The network adjusted transmit power level is based on a transmit signal strength of a communications path between the communications tower 110 and the portable cell phone 120.

(*See* Ex. J, '435 Patent at 3:39–42.) The fact that this sentence contains no conditional language, or descriptions limiting it to a particular embodiment would inform a POSA that the above statement applies generally throughout the patent, including the claims. *See, e.g., C.R. Bard, Inc. v. United States Surgical Corp.*, 388 F.3d 858, 864 (Fed. Cir. 2004) (unconditional statements in specification not tied to a particular embodiment that characterized implants and plugs as pleated applied globally and required a pleated surface for claimed plugs). In contrast, the preceding sentences, in discussing particular embodiments of the invention, use conditional language such as "may," or "for instance," and/or address specific possible values for power levels. '435 Patent at 3:31–38. In other places, the specification of the '435 Patent makes uses of terms such as "alternatively," "in an alternative embodiment," "in one embodiment," and "in another embodiment," when a particular feature or characteristic describes a particular embodiment or instance. (*See, e.g.*, Ex. J, '435 Patent at 3:55–4:4.)

This unambiguous statement defines the disputed term in Claim 1. Both phrases reference the same term: "network adjusted transmit power level." The specification's statement that this term is "<u>based on a transmit signal strength of a communications path between the communications tower 110 and the portable cell phone 120</u>," would inform a person of ordinary skill in the art that Claim 1's "network adjusted transmit power level <u>as a function of a position to a communications tower</u>," means "network adjusted transmit power level <u>as a function of a transmit signal strength of a communications path between the communications tower and the portable cell phone</u>."

The second instance in the specification confirms that "network adjusted transmit power level" is determined by the communications path between the portable cell phone and the communications tower:

> After adjusting the transmit power level, the portable cell phone then transmits at a reduced level in a step 350. In one embodiment, the adjusted transmit power level may not exceed **the network adjusted transmit power level as determined by the communications path between the portable cell phone and the communications tower**. In other embodiments, the adjusted transmit power level may be reduced to the proximity transmit power level.

(*See* Ex. J, '435 Patent at 7:21–26 (emphasis added).) Although this excerpt refers to a particular embodiment, the language identifying the characteristics of the embodiment refers to the relative power of the ultimately adjusted transmit power level of the cell phone, not the statement that the network adjusted transmit power level is determined by the communications path between the portable cell phone and communications tower. A POSA would understand that this second instance's reference to "network adjusted transmit power level as <u>determined by the communications path between the portable cell phone and the communications tower</u>" is consistent with and analogous to the first instance's description of the same term being "<u>based on a transmit signal strength of a communications path between the communications tower and the portable cell phone.</u>"

The third instance in the specification also confirms that "network adjusted transmit power level" is a function of the communications path between the portable cell phone and the communications tower:

> In one embodiment, the network adjusted transmit power level may equal the maximum transmit power level of a portable cell phone. In other embodiments, **the network adjusted transmit power level** may be a reduction from the maximum transmit power level **due to the communications path between the communications tower and the portable cell phone**.

(*See* Ex. J, '435 Patent at 7:34–40 (emphasis added).) Again, the language in the excerpt above referring to embodiments pertains to the particular value of a network adjusted transmit power level relative to a cell phone's maximum transmit power level, and not the statement that the "network adjusted transmit power level" is "due to the communications path between the communications tower and the portable cell phone." For the same reasons as mentioned above with regard to the second instance, a POSA would understand that this third instance's reference to "network adjusted transmit power level," being "<u>due to the communications path between the portable cell phone and the communications tower</u>" is consistent with and analogous to the first instance's description of the same term.

In view of the consistent and unambiguous disclosures in the specifications as to what a network adjusted transmit power level is "based on," "determined by," and "due to," the Court should adopt BNR's construction. *See Phillips*, 415 F.3d at 1315 ("the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.") (citation omitted); *Cont'l Circuits*, 915 F.3d at 796 ("When the patentee acts as its own lexicographer, that definition governs."). These three consistent and unambiguous characterizations, which also closely track the language surrounding the disputed claim term, additionally indicate that patentee intended these definitions to apply globally. *See, e.g., C.R. Bard*, 388 F.3d at 864, 866 (two unconditional statements in specification not tied to a particular embodiment applied globally, and use of language in specification containing the additional feature that is similar to language in the claims that did not explicitly contain the feature, supported construing the claim to include the defined feature.).

BNR's claim construction is also consistent with and supported by the knowledge a POSA possessed at the time of the filing of the '435 Patent regarding cell phone networks relying on transmitted signal strength information to maintain cell phone connections and call quality, as cited in the patent. A POSA would know that the transmission signal strength necessary for a signal to travel between a tower and cell phone is determined by the communications path along which these signals must travel (taking into account, for example, whether there are natural or man-made obstructions in the communications path). (*See, e.g.*, Ex. S at Appx537-538 (William Yee, *Mobile Communications Engineering – Theory and Applications* 21–22, McGraw Hill (2d ed. 1997).) ("Terrestrial losses are greatly affected by the general topography of the terrain….In general the texture and roughness of the terrain tend to dissipate propagated energy, reducing the received signal strength at the mobile unit and also at the base station….However, even under the most optimal siting conditions, there are often hills, trees, and various man-made structure and vehicles that can adversely affect the propagation of mobile-radio signals.").[9]

The prosecution history further supports BNR's proposed construction. In an Office Action mailed on August 13, 2004, the Patent Office Examiner rejected pending Claim 19 (which corresponds to Claim 1 of the '435 Patent), based on an obviousness combination involving U.S. 6,456,856 ("Werling") and U.S. 6,498,924 ("Vogel"). In connection with the "network adjusted transmit power level as a function of a position to a communications tower" limitation in then Claim 19, the examiner stated:

> 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.

(*See* Ex. K at Appx322 (August 13, 2004 Office Action at 7 from the '435 Patent's prosecution history).) The portion of the Vogel reference relied upon by the examiner related to measuring distance between a mobile station and a base station, and using this information to control transmission power of the mobile station as a function of distance between it and the base station to reduce interference levels:

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9 This book by William Yee is identified and incorporated by reference into the specification. See '435 Patent, Col. 9-13. Accordingly, this reference constitutes intrinsic evidence.

> The present invention relates more particularly to apparatus for measuring the distance, or the propagation time, between a mobile station and a base station in such a system.
>
> Such knowledge of distance or of propagation time can be used for various purposes, such as the following, given by way of example:
>
> in a mobile radiocommunications system of the Time Division Multiple Access (TDMA) type, such as in particular the Global System for Mobile communications (GSM), such knowledge can be used for the purpose of determining the timing advance to be applied to information from the mobile station so as to enable said information to be received at the base station in that one of the time channels which has been allocated to said mobile station, regardless of the propagation time between said mobile station and said base station; and
>
> in a mobile radiocommunications system of the cellular type (also such as the above-mentioned GSM), such knowledge can be used for the purpose of controlling the transmission power of the mobile station as a function of the distance between it and the base station so as to reduce the overall interference level in the system, or else so as to locate the mobile station, e.g. by combining the result of such a measurement of the distance between the mobile station and a base station with the results of measurements of the distances between said mobile station and other base stations.

(*See* Ex. T at Appx549 (U.S. 6,498,924 ("Vogel") at Col 1:10–37; Ex. K at Appx322 (August 13, 2004 Office Action at 7–8 from the '435 Patent's prosecution history).)

The applicant objected to the Vogel rejection, and in a response dated November 18, 2004 argued that the Vogel reference did not disclose "a power circuit that provides a network adjusted transmit power level as a function of a position to a communications":

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.

(*See* Ex. K at Appx336 (November 18, 2004 Response to August 13, 2004 Office Action at 9 from the '435 Patent's prosecution history).) The patent examiner agreed with the applicant, withdrew the rejection regarding Claim 19, and allowed Claims 19–27, which issued as Claims 1–9. (*See* Ex. K at Appx346, 355-358 (August 8, 2005 Office Action at 7 from the '435 Patent's prosecution history, et al).)

The prosecution history, therefore, is consistent with BNR's proposed claim construction, which emphasizes that the network adjusted transmit power level is a function of "a transmit signal strength of a communications path between the communications tower and the portable cell phone," influenced by multiple factors, including natural and man-made obstacles in the communication path—rather than simply a function of distance between a cell phone and a communication tower. *See Cont'l Circuits*, 915 F.3d at 796 (Although "it often lacks the clarity of the specification and thus is less useful for claim construction purposes," "a court should also consider the patent's prosecution history….Like the specification the prosecution history provides evidence how the [USPTO] and the inventor understood the patent.") (citations omitted).

Finally, BNR's construction completely addresses the meaning of all terms in the disputed phrase, including the meaning and scope of "position." Defendants' proposed construction, on the other hand, does little, if anything, to clarify the meaning of the disputed phrase. Defendant's construction does not define "position" other than to associate it to the cell phone, but this says nothing as to whether "position" is meant to address only distance, communication paths, or whether natural and man-made obstacles between the cell phone and tower are taken into account. Additionally, rather than elaborate on the meaning of the disputed terms, Defendants propose additional terms, such as "relative to" that are not used or defined in the specification in connection with these disputed claim terms. Accordingly, for all of the above reasons, the Court should adopt BNR's proposed construction in view of the clear intrinsic evidence and the understanding of a person of ordinary skill in the art supporting it.

IX. CONCLUSION

For the foregoing reasons, BNR respectfully requests the Court reject Defendants' constructions and adopt BNR's constructions for the disputed claim terms.

Dated: May 24, 2019

Respectfully Submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the above and foregoing document has been served on May 24, 2019 to all counsel of record who are deemed to have consented to electronic service via the Court's CM/ECF system. Pursuant to Local Rule 5.4(c), any other counsel of record will be served by electronic mail, facsimile, or overnight delivery.

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IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF CALIFORNIA

BELL NORTHERN RESEARCH, LLC, Plaintiff, v. COOLPAD TECHNOLOGIES, INC. AND YULONG COMPUTER COMMUNICATIONS, Defendants.	C.A. No. 3:18-cv-1783-CAB-BLM **DECLARATION OF SADAF R. ABDULLAH IN SUPPORT OF PLAINTIFF'S OPENING CLAIM CONSTRUCTION BRIEF** Judge: Hon. Cathy Ann Bencivengo Magistrate Judge: Hon. Barbara L. Major
BELL NORTHERN RESEARCH, LLC, Plaintiff,	C.A. No. 3:18-cv-1784-CAB-BLM

v. HUAWEI DEVICE (DONGGUAN) CO., LTD, HUAWEI DEVICE (SHENZHEN) CO., LTD., and HUAWEI DEVICE USA, INC., Defendants.	
BELL NORTHERN RESEARCH, LLC, Plaintiff, v. KYOCERA CORPORATION and KYOCERA INTERNATIONAL INC., Defendants.	C.A. No. 3:18-cv-1785-CAB-BLM
BELL NORTHERN RESEARCH, LLC, Plaintiff, v. ZTE CORPORATION, ZTE (USA) INC., ZTE (TX) INC., Defendants.	C.A. No. 3:18-cv-1786-CAB-BLM

I, Sadaf R. Abdullah, declare as follows:

1. My name is Sadaf R. Abdullah. I am a partner with the law firm of Skiermont Derby LLP, and I represent Bell Northern Research, LLC ("BNR"), the plaintiff in this lawsuit. It is by virtue of that position and my own involvement in these events that I have personal knowledge of the matters set forth below.

2. True and correct copies of the following documents are attached as exhibits and stamped with the letters and numbering indicated below.

Exhibit	Description	Appx. No.
A	U.S. Patent No. 7,319,889 to Goris, et al., issued January 15, 2008	001-012
B	Excerpts of the Certified File History for U.S. Patent No. 7,319,889.	013-055
C	U.S. Patent No. 8,204,554 to Goris, et al., issued June 19, 2012	056-066
D	Excerpts of the Certified File History for U.S. Patent No. 8,204,554.	067-221
E	U.S. Patent No. 7,990,842 to Trachewsky, et al., issued August 2, 2011	222-232
F	U.S. Patent No. 8,416,862 to Aldana, et al., issued April 3, 2013	233-253
G	U.S. Patent No. 7,957,450 to Hansen, et al., issued June 7, 2011	254-275
H	U.S. Patent No. 6,941,156 to Mooney, issued September 6, 2005	276-289
I	Excerpts of the Certified File History for U.S. Patent No. 6,941,156	290-301
J	U.S. Patent No. 7,039,435 to McDowell, et al., issued May 2, 2006	302-311
K	Excerpts of the Certified File History for U.S. Patent No. 7,039,435	312-358
L	Amended Declaration of Dr. Vijay Madisetti In Support of Plaintiff's Claim Constructions dated May 2, 2019 ("Madisetti Op. Decl.")	359-425
M	Rebuttal Declaration of Dr. Vijay Madisetti In Support of Plaintiff's Claim Constructions dated May 8, 2019 ("Madisetti Rebuttal Decl.")	426-467

Exhibit	Description	Appx. No.
N	Sur-Rebuttal Declaration of Dr. Vijay Madisetti In Support of Plaintiff's Claim Constructions dated May 16, 2019 ("Madisetti Sur-Rebuttal Decl.")	468-474
O	Excerpts from the May 1, 2019 Declaration of Paul Min, Ph.D. Regarding Claim Construction ("Min Op. Decl.")	475-492
P	Excerpts from the May 19, 2019 Deposition of Paul Min, Ph.D. ("Min Dep.")	493-519
Q	Excerpts from Webster's Unabridged Dictionary (2001)	520-522
R	Excerpts from Rebuttal Declaration of Dr. Jonathan Wells, Ph.D. dated May 8, 2019 ("Wells Rebuttal Decl.")	523-529
S	Excerpts from William Yee, *Mobile Communications Engineering – Theory and Applications*, McGraw Hill (2d ed. 1997)	530-543
T	U.S. 6,498,924 ("Vogel")	544-552
U	Ronald N. Bracewell, *The Fourier Transform and its Applications* (3rd ed., 2000)	553-560
V	Discrete Fourier Transform based Multimedia Colour Image Authentication for Wireless Communication (DFTMCIAWC)	561-566
W	Spatial Channel and System Characterization	567-571

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 24th day of May, 2019, in Dallas, Texas.

Respectfully submitted,

Sadaf R. Abdullah

Sadaf R. Abdullah

EXHIBIT A

U 7689668

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

August 14, 2018

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF:

U.S. PATENT: *7,319,889*
ISSUE DATE: *January 15, 2008*

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

John A. B

JOHN A BURSON
Certifying Officer

US007319889B2

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

(10) **Patent No.: US 7,319,889 B2**
(45) **Date of Patent: *Jan. 15, 2008**

(54) **SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION**

(75) Inventors: **Norman Goris**, Dortmund (DE); **Wolfgang Scheit**, Rothenbach (DE)

(73) Assignee: **Agere Systems Inc.**, Allentown, PA (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/516,316**

(22) Filed: **Sep. 6, 2006**

(65) **Prior Publication Data**

US 2007/0004470 A1 Jan. 4, 2007

Related U.S. Application Data

(63) Continuation of application No. 10/463,630, filed on Jun. 17, 2003, now Pat. No. 7,113,811.

(51) **Int. Cl.**
H04M 1/00 (2006.01)

(52) **U.S. Cl.** **455/574**; 455/566; 455/41.2; 455/343.1; 455/550.1

(58) **Field of Classification Search** 455/550.1, 455/41.2, 566, 572–574, 343.1–343.6, 90.1–90.3, 455/69, 522; 315/169.3, 160; 345/211, 345/156, 166, 169; 713/230, 300–340; 340/7.32, 539.23, 539.26, 539.3; 379/55.1, 379/56.1–56.3, 370–376.02
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,712,911 A	1/1998	Her	379/388.01
5,881,377 A	3/1999	Giel et al.	455/343.1
5,884,156 A	3/1999	Gordon	455/552.1
6,246,862 B1	6/2001	Grivas et al.	3/566
6,265,833 B1	7/2001	Kim et al.	315/169.3
6,278,887 B1	8/2001	Son et al.	455/566
6,330,457 B1	12/2001	Yoon	455/550.1
6,665,803 B2 *	12/2003	Lunsford et al.	713/320
6,684,294 B1	1/2004	Huffman	711/112
6,726,099 B2	4/2004	Becker et al.	235/380
D493,451 S	7/2004	Wada	D14/247
6,836,212 B2	12/2004	Sawinski	340/539.23
6,853,850 B2	2/2005	Shim et al.	455/560.1
2002/0084998 A1	7/2002	Sawada	345/211
2002/0177475 A1	11/2002	Park	455/574
2003/0036412 A1	2/2003	Chong	455/566
2003/0197597 A1 *	10/2003	Bahl et al.	340/7.32
2004/0097261 A1	5/2004	Ujii	455/575.1
2004/0198458 A1	10/2004	Kawamura	455/566

(Continued)

FOREIGN PATENT DOCUMENTS

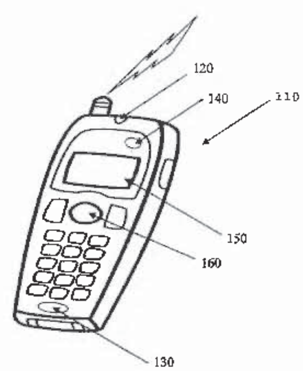
DE 195 37 224 A1 8/1995

Primary Examiner—George Eng
Assistant Examiner—Kamran Afshar

(57) **ABSTRACT**

In one embodiment, a mobile station including a chassis having a display, a power reducer, a proximity sensor, and a microprocessor. The power reducer controls power consumption of the display. The proximity sensor is coupled to the chassis and causes the power consumption to be reduced when the display is within a predetermined range of an external object. The microprocessor is coupled to the proximity sensor and to the display and automatically activates the proximity sensor based on the mobile station receiving an incoming wireless telephone call.

13 Claims, 4 Drawing Sheets



U.S. PATENT DOCUMENTS

2004/0225904	A1	11/2004	Perez et al.	713/320
2004/0252115	A1*	12/2004	Boireau	345/211
2006/0019724	A1*	1/2006	Bahl et al.	455/574
2003/0284848	*	12/2006	Lin	345/169

* cited by examiner

FIGURE 1

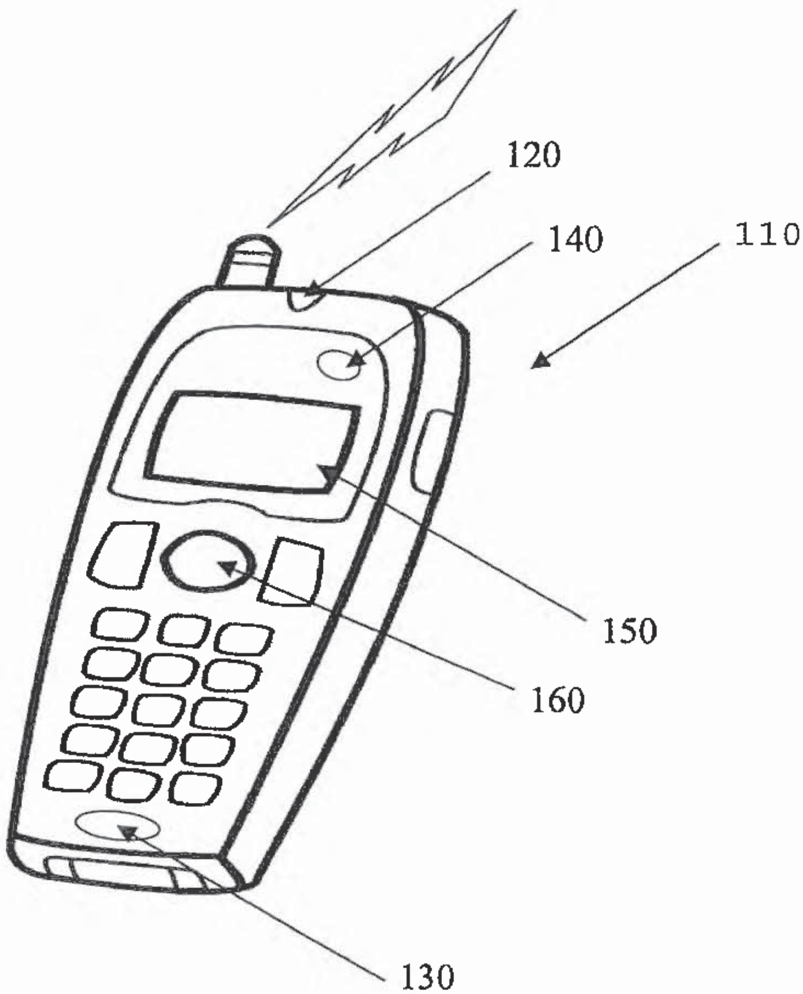
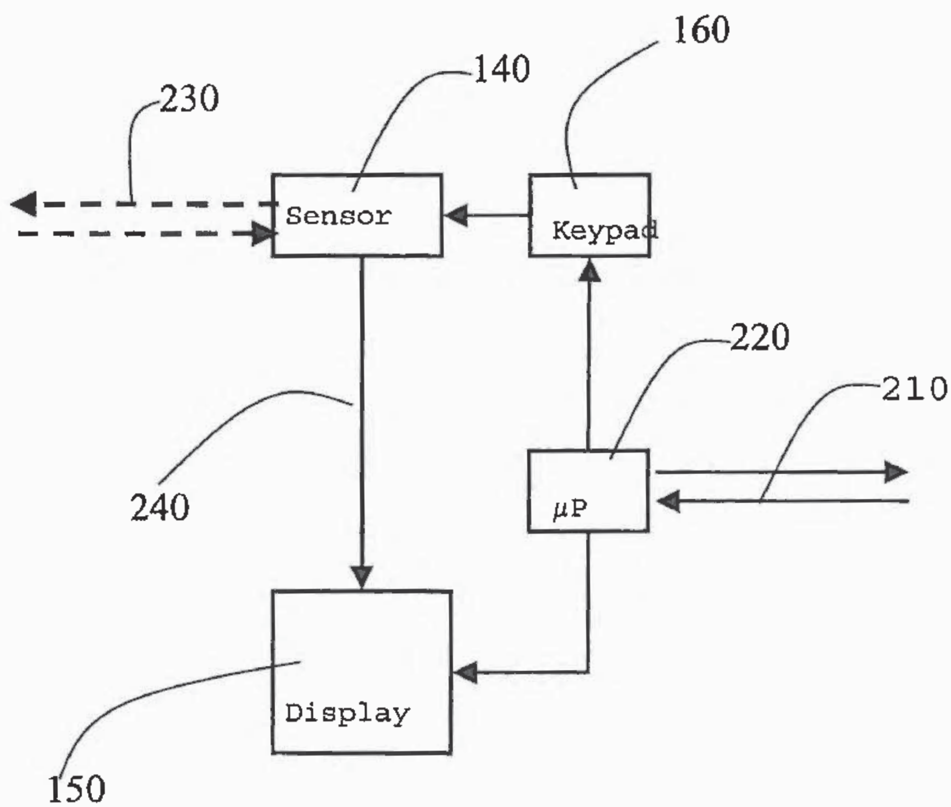


FIGURE 2



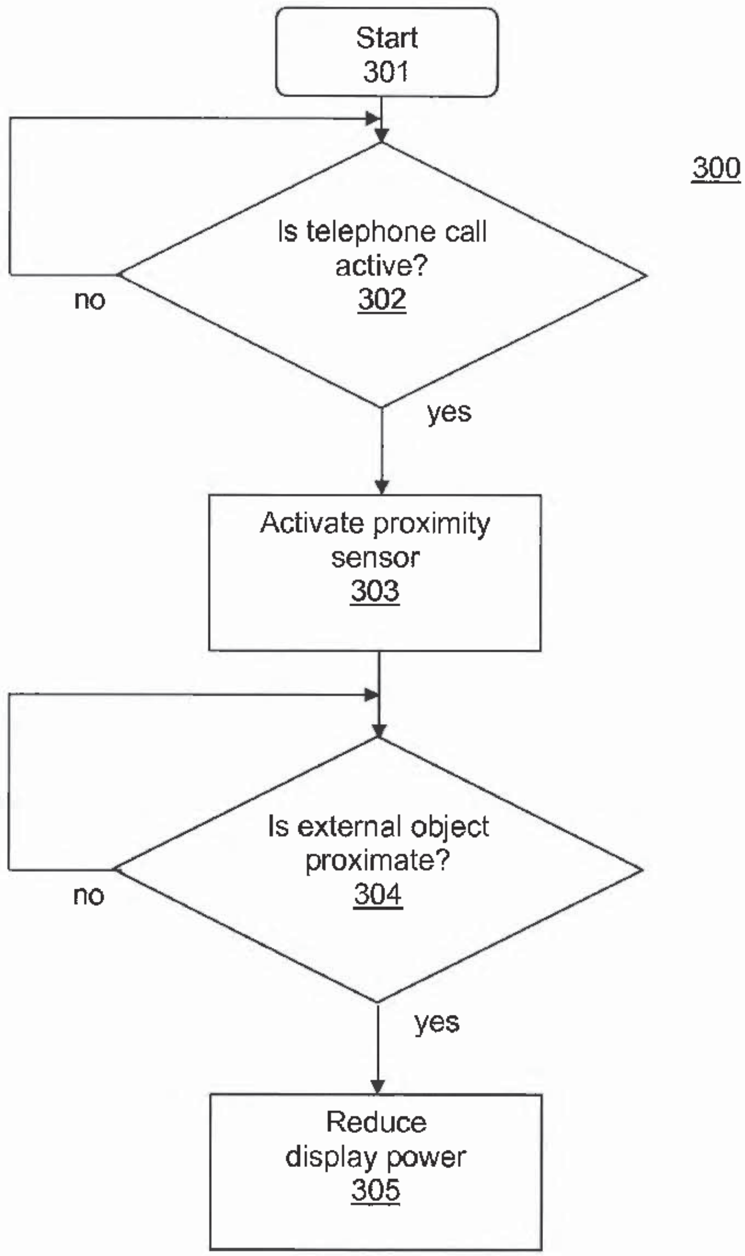

Start
301
300
Is telephone call
active?
302
no
yes
Activate proximity
sensor
303
Is external object
proximate?
304
no
yes
Reduce
display power
305

FIGURE 3

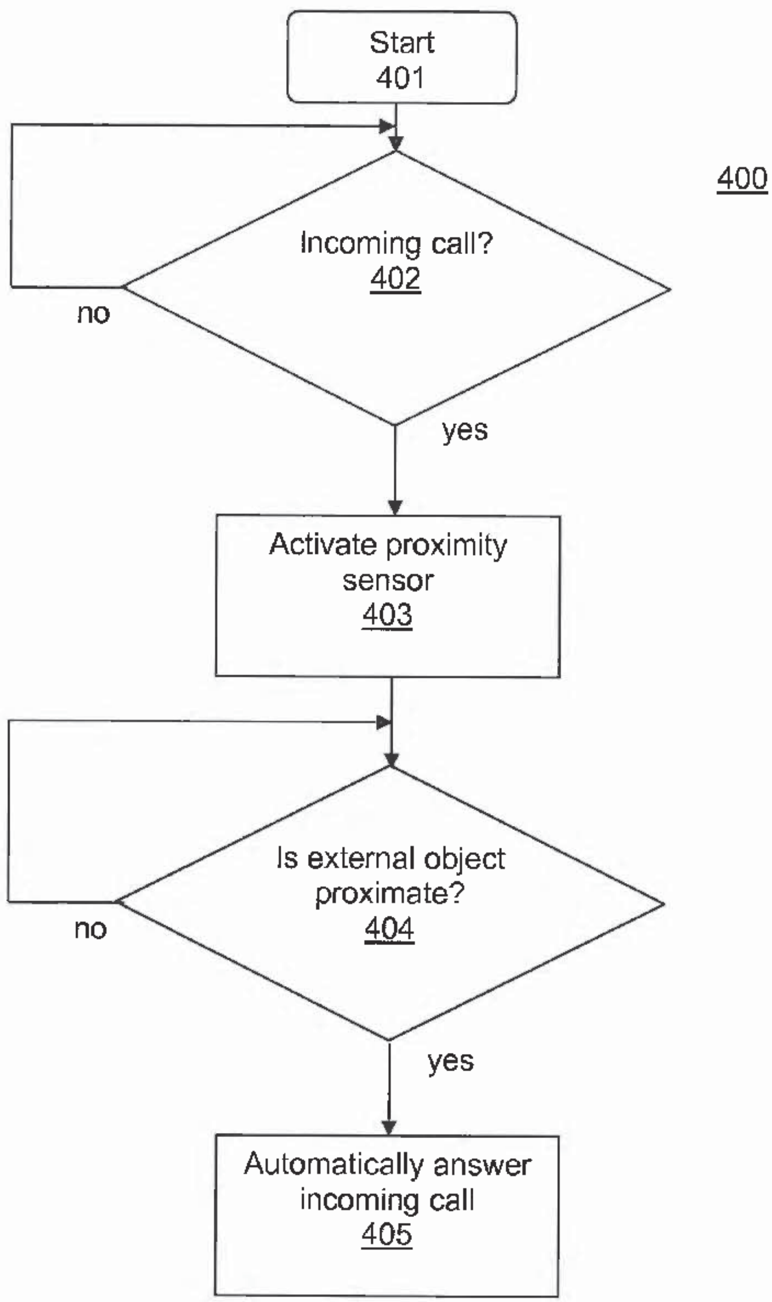

Start
401
400
Incoming call?
402
no
yes
Activate proximity sensor
403
Is external object proximate?
404
no
yes
Automatically answer incoming call
405

FIGURE 4

SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. application Ser. No. 10/463,630, filed on Jun. 17, 2003, now U.S. Pat. No. 7,113,811 the teachings of which are incorporated herein by reference.

TECHNICAL FIELD OF THE INVENTION

The present invention is directed, in general, to mobile stations and, more specifically, to a mobile station of mobile radio system having a reduced power consumption under certain operating conditions.

BACKGROUND OF THE INVENTION

Mobile stations have found many uses in today's world. When paired with a single base station located at a user's own premises, they are called "cordless telephones." When they interact with various, geographically distributed cellular base stations, they are called "cellular telephones" or simply "cell phones."

Usually the stand-by time, as well as the talk-time, of a mobile station depend on the lifetime of a (rechargeable) battery inserted within the mobile station and hence, on the load and/or on the capacity of the battery.

Increasing of the capacity of the battery would increase the lifetime of the mobile station, but batteries having increased capacities are often larger, heavier or more expensive, none of which are desirable attributes for a portable, affordable mobile station. Accordingly, what is needed in the art is a way to prolong the lifetime of a mobile station without having to use a battery with an increased capacity.

SUMMARY OF THE INVENTION

To address the above-discussed deficiencies of the prior art, the present invention provides a mobile station, including: (1) a chassis having a display and (2) a proximity sensor coupled to the chassis and adapted to cause a power consumption of the display to be reduced when the display is within a predetermined range of an external object.

Thus, by reducing the power consumption of the display of an activated telephone set in case the display is not needed, i.e., in particular during a telephone call, current is saved instead of needlessly consumed from the (rechargeable) battery. Accordingly, the spared available battery power may be significant, especially for color displays, resulting in an overall increasement of the stand-by and/or talk time of the telephone set.

According to preferred embodiments the means are adapted to switch-off the display in response to a detection that the set, preferably the display of the set, is attached near to an object, in particular to the ear.

As a consequence, if a call for example is incoming for example, possibly the user wants to see by means of the display the number and/or the stored name of the calling party. However, if the user wants to accept the call and hence is attaching the telephone set to the ear, the invention enables that the display is switched off. In a similar way, in case the user is trying to call a third party he may want to have a look at the display for verifying the entered number, but when the call is established he is likewise attaching the set and accordingly the display to his ear for performing the call. On the other hand, as long as the telephone set is inside a pocket, for example, it is not necessary to keep the display in an on-condition or to indicate the number and/or the name of a calling party.

Moreover, the means may be further adapted to switch-on the display in response to a detection that the set, preferably the display of the set, is moved away from any object, in particular from the ear.

As an alternative or in addition, the triggering event for current saving purposes may also be selectable by the user, for example via a menu list. According to further preferred refinements, the proximity sensor is proposed to be a heat flow or temperature sensor, an optical or infrared sensor, or a load sensor. However, as a further advantage, basically any kind of proximity sensor which is capable of observing a close range or small distance may be used.

Correspondingly, the invention proposes a method for saving available battery power of a mobile station, in particular of a mobile station comprising the steps of detecting an attachment of the set, in particular of the display of said set near to an object, in particular to the ear, and switching off the display in response to such a detection in case the display is in an on-condition.

The foregoing has outlined, rather broadly, preferred and alternative features of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they can readily use the disclosed conception and specific embodiment as a basis for designing or modifying other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIG. 1 schematically depicts a preferred embodiment of a mobile station having the inventive detection functionality; and

FIG. 2 schematically depicts a block diagram showing essential components of the invention;

FIG. 3 is a flow diagram of exemplary steps for reducing power to a display; and

FIG. 4 is a flow diagram of exemplary steps for automatically answering an incoming call.

DETAILED DESCRIPTION

FIG. 1 illustrates a mobile station 110 of a mobile radio telecommunication system having a loudspeaker 120 and a microphone 130. A proximity sensor 140 is located near a display 150 toward a side of the loudspeaker 120. A keypad 160 allows a user (not shown) to establish an outgoing call, accept an incoming call and/or terminate an active call. However, it should be apparent to one skilled in the pertinent art, that these functionalities can be also performed by other control means, for example by speech control. The proximity sensor 140 is integrated within the mobile station 110 to enable a functionality as described in more detail with regard to FIG. 2.

As can be seen from FIG. 2, an incoming call may be managed by a central processing unit 220, for example for further specific processing. For example, the number or the name of the calling party stored within a storage (not referenced) implemented within the mobile station 110 can be depicted at the display 150.

If the user of the mobile station 110 wants to accept the incoming call 210, he may press a key on the keypad 160 or issue a voice command. Alternatively, an incoming call may directly activate the proximity sensor 140 without the necessity of pressing a key on the keypad 160 to accept the call.

In response to the acceptance of the incoming call 210 or automatically, the proximity sensor 140 is activated to monitor a proximity 230 to an external object (not shown), for example a range of about five centimeters. This is preferably done by a standard low-cost proximity sensor, for example a thermal sensor. However, other proximity sensors, such as conventional mechanical proximity (load) sensors, optical sensors or range detecting sensors, fall within the broad scope of the present invention. If the proximity sensor 140 detects an external object (such as the user's ear) within the monitored range, the power consumption of the display 150 is reduced, most preferably by switching the display 150 completely off, as indicated by an arrow 240, to spare battery power during the telephone call.

When the telephone call 210 is finished, the user of the mobile station 110 typically moves the mobile station 110 away from his ear. This causes the proximity sensor 140 to move out of range of the external object (in this case the user's ear). Accordingly, in response thereto, the display 150 is switched back on, enabling the user to look at information on the display 150.

Correspondingly, for an outgoing call, the proximity sensor 140 is activated by pressing a key on the keypad 160 to establish the outgoing call to a third party. As long as the outgoing call remains in effect and the proximity sensor 140 detects proximity to an external object, e.g., the ear of the user, the display 150 remains in a state of reduced power consumption, or off, as the case may be.

The function of switching the display off or on or otherwise reducing the amount of power the display consumes may comprise hardware and/or software components. For example, electronically readable instructions executable in the central processing unit 220 may be stored on a memory chip located in the mobile station 110 and adapted to cooperate with the proximity sensor 140 to perform the function.

Moreover, if the proximity sensor 140 is directly activated by an incoming call or automatically activated, the display can be kept in a switched-off condition as long as the mobile station 110 is, for example, within a pocket (not referenced) or the like and is only switched on when the user retrieves the mobile station 110 from the pocket to enable the user to look on the display 150 for an information about the calling party. If the user then wants to accept the call and thence places the mobile station 110 proximate an external object, such as his ear, the proximity sensor 140 again detects an object, causing the display again to be switched off.

FIG. 3 illustrates exemplary steps for reducing power to a display, as described above, and FIG. 4 illustrates exemplary steps for automatically answering an incoming call, as described above.

Although the present invention has been described in detail, those skilled in the art should understand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the invention in its broadest form.

What is claimed is:

1. A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of proximity of an external object; and

a microprocessor adapted to:

(a) determine whether a telephone call is active;

(b) receive the signal from the proximity sensor, and

(c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object; wherein:

the telephone call is a wireless telephone call;

the microprocessor reduces power to the display while the signal indicates the proximity of the external object only if the microprocessor determines that the wireless telephone call is active; and

the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless telephone call.

2. The mobile station of claim 1, wherein the microprocessor reduces power to the display only if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

3. The mobile station of claim 1, wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

4. The mobile station as recited in claim 1, wherein the microprocessor reduces power to the display by turning off the display.

5. The mobile station as recited in claim 1, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

6. The mobile station as recited in claim 1, wherein the proximity sensor is located proximate to the display.

7. The invention of claim 1, wherein, if (i) the microprocessor determines that the incoming wireless telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming wireless telephone call is automatically answered without any further action by the user.

8. A method of conserving battery power in a mobile station, comprising:

detecting whether an external object is proximate;

determining whether a telephone call is active; and

reducing power consumption of a display of the mobile station if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected; wherein:

the telephone call is a wireless telephone call;

the power consumption of the display is reduced while the proximity of the external object is detected only if the wireless telephone call is determined to be active; and

detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless telephone call.

9. The method of claim 8, wherein the power consumption of the display is reduced only if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected.

10. The method of claim 8, further comprising:

if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then automatically answering the incoming telephone call.

11. The method as recited in claim 8, wherein reducing power consumption of the display comprises turning off the display.

12. The method as recited in claim 8, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

13. The method of claim 8, further comprising:

if (i) the incoming wireless telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then automatically answering the incoming wireless telephone call without any further action by the user.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,319,889 B2
APPLICATION NO. : 11/516316
DATED : January 15, 2008
INVENTOR(S) : Norman Goris and Wolfgang Scheit

Page 1 of 1

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

On Title page item 56

On page 2, U.S. PATENT DOCUMENTS, replace "2003/0284848" with --2006/0284848--.

Signed and Sealed this

Third Day of June, 2008

Jon W. Dudas

JON W. DUDAS
Director of the United States Patent and Trademark Office

EXHIBIT B

7689668

THE UNITED STATES OF AMERICA

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UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

August 13, 2018

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF THE FILE WRAPPER AND CONTENTS OF:

APPLICATION NUMBER: ***11/516,316***
FILING DATE: ***September 06, 2006***
PATENT NUMBER: ***7319889***
ISSUE DATE: ***January 15, 2008***

UNITED STATES PATENT AND TRADEMARK OFFICE
DEPARTMENT OF COMMERCE

Certified by

Andrei Iancu

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

Office Action Summary	Application No. 11/516,316	Applicant(s) GORIS ET AL.	
	Examiner Kamran Afshar, 571-272-7796	Art Unit 2617	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *20 November 2006*.

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) *1-33* 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) *1-33* 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 *09/06/2006* 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/SB/08) Paper No(s)/Mail Date *09/06/2006*.

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

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

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

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 21, 23, 28, 30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Regarding claims 21 and 28, the original specification fails to support the newly add limitation " a microprocessor adapted to: determine whether a telephone call is active ", " determining whether a telephone call is active", " the incoming telephone call is automatically answered", as recited in the claims.

2. Claims 21, 23, 28, 30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Regarding claims 21 and 28, the original specification fails to support the newly add limitation " a microprocessor adapted to: determine whether a telephone call is active ", " determining whether a telephone call is active", " the incoming telephone call is automatically answered", as recited in the claims.

Claims 22-27 and 29-33 are rejected as they are directly and or indirectly depended on rejected claim.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "a microprocessor adapted to: determine whether a telephone call is active " determining whether a telephone call is active "," the incoming telephone call is

automatically answered", must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Double Patenting

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

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claims 1-33 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 7,113,811 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same

subject matter which includes: 1) A mobile station, 2) a chassis having a display, 3) a power reducer configured to control power consumption of said display, 4) a proximity sensor coupled to said chassis and configured to cause said power consumption to be reduced when said display is within a predetermined range of an external object, 5) and a microprocessor coupled to said proximity sensor coupled to said display, 6) said microprocessor configured to automatically activate said proximity sensor based on said mobile station receiving an incoming wireless telephone call, 7) proximity sensor causes said display to be turned off, etc.

"A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or **anticipated by**, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651 (affirming a holding of obviousness-type double patenting because the claims at issue were obvious over claims in four prior art patents); In re Berg, 140 F.3d at 1437, 46 USPQ2d at 1233 (Fed. Cir. 1998) (affirming a holding of obviousness-type double patenting where a patent application claim to a genus is anticipated by a patent claim to a species within that genus). " ELI LILLY AND COMPANY v BARR LABORATORIES, INC., United States Court of Appeals for the Federal Circuit, ON PETITION FOR REHEARING EN BANC (DECIDED: May 30, 2001).

Claim Rejections - 35 USC § 102

6. 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before

November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 1-6, 8-13, 15-18, 20-22, 24-26, 28-29, and 31-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

With respect to claims 1, 8, 15, Perez discloses a method / a mobile station (See i.e. radio communication apparatus, Title, Abstract), comprising: a chassis having a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); power reducer configured to control power consumption of the display (See e.g. processor 16 of Fig. 1 is programmed to at least reduce power provided to the display the sensor detects the talk condition, Co Page 1, paragraph [0013]) and a proximity sensor (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1) coupled inherently to the chassis and activated based on the mobile station inherently wirelessly receiving a incoming telephone call (See e.g. Page 2, Paragraph [0014]) and / or a telephone call associated with mobile station (See talk condition involved a phone call starting, Page 2, Paragraph [0016]), the talk condition should generally be understood as the condition when a user is on an active call (that is when inherently the mobile station receiving incoming phone call and speaking into the microphone or listening to the earpiece. A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (See e.g. Page 3, for the by pressing or depressing keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display) Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]), the proximity sensor adapted to cause a power consumption of (i.e. conserving power) display (See e.g. 10, 12, 24, 26, 28, 30 of Fig. 1) to be reduced and / or turned off (See e.g. 56 of Fig. 2) when display is within a predetermined range (i.e. predetermined angle-range, position, volume, spectrum energy or density) of an external object (See e.g. user's head , user's ear, user's face, user's hand, user's pocket, or bag, etc. Page 2, Paragraph [0015]) and / or during a telephone call (See e.g. Page 1, Paragraph [0009], Page 3, Paragraph [0020]).

Regarding claims 2, 9, 24, 31, Perez discloses the proximity sensor causes display to be turned off / the display(See e.g. 56 of Fig. 2).

Regarding claims 3, 10, Perez discloses the proximity sensor causes power consumption to be reduced when display is within predetermined range during the telephone call (See e.g. talk condition, 56 of Fig. 2, Page 3, Paragraph [0020]).

Regarding claims 4, 11, 16, 25, 32 Perez discloses a mechanical proximity sensor, an optical sensor, and a range detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claims 5, 17, 26, Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claim 6, Perez discloses the proximity sensor is activated automatically (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) when telephone call is (inherently) a wireless incoming call (that is when the mobile station starts an active call receiving an incoming call which is one of many ways of the talk condition, See Page 2, Paragraph [0016]) and is activated manually when telephone call is a wireless outgoing call (that is when by depressing a key manually activating and out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020]).

Regarding claim 18, Perez discloses the proximity sensor is located on a speaker side of chassis (See e.g. 10, 24, 26, 28, 30 of Fig. 1).

Regarding claim 12, Perez discloses the proximity sensor is activated based on user interaction with a keypad (i.e. key-activity, talk condition, pressing / depressing the key or button, etc.) of the mobile station when the telephone call is outgoing call (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

Regarding, claim 13, Perez discloses causing the power consumption to be reduced independent of whether the mobile station is being used during the telephone call (See Perez e.g. sensor or sensors 100, and automatic adjusting power consumption and / or the sensor is activated automatically, Page, 2, Paragraph [0019]).

Regarding, claim 20, Perez discloses the proximity sensor is activated manually (i.e. key-activity, talk condition, pressing / depressing the key or button, Page 2, ¶ [0017]) when the mobile station initiates an outgoing wireless telephone (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

With respect to claims 21, 28, Perez discloses a method of conserving battery power in a mobile station / a mobile station See i.e. radio communication apparatus, Title, Abstract), comprising: a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); a proximity sensor adapted to generate a signal indicative of proximity of an external object (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]); and a microprocessor adapted to (See e.g. 16 of Fig. 1, Page 1, ¶ [0013, 102 of Fig. 3, Page , 2 ¶ [0019]): (a) determine whether a telephone call is active (Se e.g. sensor can be used for detecting a user condition of the portable communication device such as a talk condition when the user is assumed to be talking on the portable communication device and the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]); (b) receive the signal from the proximity sensor (See e.g. signal, Page 1,¶ [0012]); and (c) reduce power to the display if (See e.g. reduce power, display, Page 1 ¶ [0013]) (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims 22, 29, Perez discloses (See e.g. the microprocessor the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]) reduces power to the display (See e.g. reduce power, display, Page 1 ¶ [0013]) only if (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Claim Rejections - 35 USC § 103

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

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

9. Claims 7, 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Sawada (U.S. Pub. No.: 2002/084998 A1).

With respect to claims 7, 14, 19, Perez discloses everything as discussed above in the rejected claims 1, 8, 15. In an analogous field of endeavor, Perez further discloses the proximity sensor is measuring the distance and / or the range of proximity of the user ear (i.e. user's head to earpiece, See Co. 2, ¶ [0015]) the mobile station. However, Perez does not explicitly disclose the predetermined range is about five centimeters. Sawada discloses the predetermined range is about five centimeters (See Sawada e.g. 21a, 37 of Fig. 1, Page 3, ¶ [0037]). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Sawada to Perez to set the range about five centimeters to the external object (i.e. the user ear, a pocket, and or a bag) so that the proximity sensor measuring the range (i.e. distance, threshold, etc.) is aware of the area surrounding the mobile station (See Sawada e.g. Page 1, ¶ [0009]), and the predetermine range (i.e. threshold) is set in as a few centimeters (See Sawada e.g. Page 3, ¶ [0037]).

10. Claims 23, 27, 30, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Her (U.S. Patent 5,712,911).

With respect to claims 23, 30, Perez discloses everything as discussed above in the rejected claims 21, 28. However, Perez dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered. In an analogous field of endeavor, Her discloses a vigoursely well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and

microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Regarding claims 27, 33, it is obvious that the proximity sensor begins detecting (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call (that is when by depressing a key manually activating and out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020]).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Boireau (U.S. Pub. No.: 2004/0252115 A1).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

K. A.

Kamran Afshar

George Eng
GEORGE ENG
SUPERVISORY PATENT EXAMINER

SPECIFICATION

Please amend the paragraph appearing on page 3, line 2, as follows:

FIG. 2 schematically depicts a block diagram showing essential components of the invention;
FIG. 3 is a flow diagram of exemplary steps for reducing power to a display; and
FIG. 4 is a flow diagram of exemplary steps for automatically answering an incoming call.

Please insert the following new paragraph just prior to the paragraph beginning on page 4, line 13:

FIG. 3 illustrates exemplary steps for reducing power to a display, as described above, and FIG. 4 illustrates exemplary steps for automatically answering an incoming call, as described above.

CLAIMS

1-20. (Cancelled)

21. (Previously Presented) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of proximity of an external object; and

a microprocessor adapted to:

(a) determine whether a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

22. (Previously Presented) The mobile station of claim 21, wherein the microprocessor reduces power to the display only if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

23. (Previously Presented) The mobile station of claim 21, wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

24. (Previously Presented) The mobile station as recited in claim 21, wherein the microprocessor reduces power to the display by turning off the display.

25. (Previously Presented) The mobile station as recited in claim 21, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

26. (Previously Presented) The mobile station as recited in claim 21, wherein the proximity sensor is located proximate to the display.

27. (Previously Presented) The mobile station as recited in claim 21, wherein the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call.

28. (Previously Presented) A method of conserving battery power in a mobile station, comprising:

detecting whether an external object is proximate;

determining whether a telephone call is active; and

reducing power consumption of a display of the mobile station if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected.

29. (Previously Presented) The method of claim 28, wherein the power consumption of the display is reduced only if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected.

30. (Previously Presented) The method of claim 28, further comprising:

if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then automatically answering the incoming telephone call.

31. (Previously Presented) The method as recited in claim 28, wherein reducing power consumption of the display comprises turning off the display.

32. (Previously Presented) The method as recited in claim 28, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

33. (Previously Presented) The method as recited in claim 28, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing telephone call.

34. (New) The invention of claim 21, wherein:

the telephone call is a wireless telephone call;

the microprocessor reduces power to the display while the signal indicates the proximity of the external object only if the microprocessor determines that the wireless telephone call is active; and

the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless telephone call.

35. (New) The invention of claim 34, wherein, if (i) the microprocessor determines that the incoming wireless telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming wireless telephone call is automatically answered without any further action by the user.

35. (New) The invention of claim 28, wherein:

the telephone call is a wireless telephone call;

the power consumption of the display is reduced while the proximity of the external object is detected only if the wireless telephone call is determined to be active, and

detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless telephone call.

37. (New) The method of claim 36, further comprising:

if (i) the incoming wireless telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then automatically answering the incoming wireless telephone call without any further action by the user.

38. (New) The mobile station as recited in claim 21, wherein the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station receiving an incoming telephone call.

39. (New) The method as recited in claim 28, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station receiving an incoming telephone call.

REMARKS/ARGUMENTS

Claims 1-33 were previously pending in the application. Claims 1-20 are cancelled herein, and claims 34-39 are added herein. Assuming entry of this amendment, claims 21-39 are now pending. The Applicant hereby requests examination of the application in view of the foregoing amendments and these remarks.

Written Description and Enablement Rejections Under §112, First Paragraph

In paragraph 1 of the action, the Examiner rejected claims 21, 23, 28, and 30 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In paragraph 2 of the action, the Examiner rejected claims 21, 23, 28, and 30 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. In particular, the Examiner asserts that the specification fails to support the limitations: "a microprocessor adapted to determine whether a telephone call is active" (claim 21), "determining whether a telephone call is active" (claim 28), and "the incoming telephone call is automatically answered" (claims 23 and 30). The Applicant respectfully submits that the specification and claims 21, 23, 28, and 30 do indeed comply with the written description and enablement requirements.

Support for "a microprocessor adapted to determine whether a telephone call is active" and "determining whether a telephone call is active" can be found at p. 3, lines 12-15, 19-21, and 31-32, and p. 4, lines 1-5, of the specification. More specifically, p. 3, at lines 12-15, discloses that "an incoming call may be managed by a central processing unit 220, for example for further specific processing." Central processing unit 220 is shown in FIG. 2 and labeled "μP," which is an abbreviation for "microprocessor." Additionally, p. 3, at lines 19-21, discloses that "[i]n response to the acceptance of the incoming call 210 or automatically, the proximity sensor 140 is activated to monitor a proximity 230 to an external object." and p. 3, at lines 31-32, discloses that "for an outgoing call, the proximity sensor 140 is activated by pressing a key on the keypad 160 to establish the outgoing call to a third party." Additionally, p. 4, at lines 1-2, discloses that the "function of switching the display off or on or otherwise reducing the amount of power the display consumes may comprise hardware and/or software components." Additionally, p. 4, at lines 2-5, provides an example wherein "electronically readable instructions executable in the central processing unit 220 may be stored on a memory chip located in the mobile station 110 and adapted to cooperate with the proximity sensor 140 to perform the function." Moreover, original claim 1 (which is cancelled herein) recites "a microprocessor coupled to said proximity sensor and coupled to said display, said microprocessor configured to automatically activate said proximity sensor based on said mobile station receiving an incoming wireless telephone call;" original claim 8 (which is also cancelled herein) recites "employing a microprocessor of said mobile station to automatically activate a proximity sensor when said mobile station receives an incoming wireless telephone call;" and original claim 15 (which is also cancelled herein) recites that "said microprocessor configured to automatically activate said proximity sensor based on said mobile station receiving said incoming wireless telephone call." Thus, the specification reasonably conveys to one skilled in the relevant art "a microprocessor adapted to determine whether a telephone call is active" and "determining whether a telephone call is active."

Support for "the incoming telephone call is automatically answered" can be found at p. 3, lines 17-18, and p. 4, lines 1-5, of the specification. More specifically, p. 3, at lines 17-18, discloses that "an incoming call may directly activate the proximity sensor 140 without the necessity of pressing a key on the keypad 160 to accept the call." Thus, the specification reasonably conveys to one skilled in the relevant art that "the incoming telephone call is automatically answered."

Drawing Objections

In paragraph 3 of the action, the Examiner objected to the drawings as failing to show every claimed feature, namely, "a microprocessor adapted to determine whether a telephone call is active," "determining whether a telephone call is active," and "the incoming telephone call is automatically answered." CPU 220 is clearly shown in FIG. 2 and labeled "μP," which is an abbreviation for "microprocessor." Furthermore, a Transmittal of Drawings including new FIGs. 3 and 4 is being filed with this Amendment. Support for FIG. 3 is found, e.g., at p. 3, lines 12-15, 19-21, and 31-32, and p. 4, lines 1-5 of the specification. Support for FIG. 4 is found, e.g., at p. 3, lines 17-18, and p. 4, lines 1-5 of the specification. FIG. 3 clearly shows a step of determining whether a telephone call is active (step 302), and FIG. 4 clearly shows a step wherein the incoming call is automatically answered (step 405). Thus, it is believed that the drawing objections have been overcome.

Double-Patenting Rejections

In paragraph 4 of the action, the Examiner rejected claims 1-33 on the ground of nonstatutory obviousness-type double patenting as unpatentable over claims 1-20 of U.S. Patent No. 7,113,811. In response, the Applicant submits that, if necessary, a terminal disclaimer will be filed after indication of allowable subject matter in the present application.

Art Rejections

In paragraph 7 of the action, the Examiner rejected claims 1-6, 8-13, 15-18, 20-22, 24-6, 28-29, and 31-32 under 35 U.S.C. §102(e) as anticipated by U.S. Patent Application Pub. No. 2004/0225904 A1 ("Perez").

In paragraph 9 of the action, the Examiner rejected claims 7, 14, and 19 under 35 U.S.C. §103(a) as obvious over Perez in view of U.S. Patent Application Pub. No. 2002/084998 A1 ("Sawada").

In paragraph 10 of the action, the Examiner rejected claims 23, 27, 30, and 33 under 35 U.S.C. §103(a) as obvious over Perez in view of U.S. Patent No. 5,712,911 ("Her").

For the following reasons, the Applicant submits that claims 21-39 are allowable over the cited references.

Claims 21-33

Claim 21 recites, *inter alia*:

> a microprocessor adapted to:
> (a) determine whether a telephone call is active;
> (b) receive the signal from the proximity sensor; and
> (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

The Examiner argues in paragraph 7 of the action that Perez discloses a "power reducer configured to control power consumption of the display (See e.g. processor 16 of Fig. 1 is programmed to at least reduce power provided to the display the sensor detects the talk condition, Co Page 1, paragraph [0013])" (sic). Perez provides a number of examples of how a "talk condition" can be detected:

- A talk condition, for example, can be sensed by detecting if a predetermined volume of acoustic sound is being received at the microphone 20 or at another sensor such as a proximity sensor 26 indicative of a user talking on the portable communication device (paragraph [0015]);

- Alternatively, a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24 (paragraph [0015]);

- A talk condition can also be sensed by detecting an angle at which the portable communication device 10 is positioned or by detecting a vibration of the portable communication device 10 (paragraph [0015]);

- Another way for sensing a talk condition can be achieved by sensing if the portable communication device 10 is in a user's hand (paragraph [0015]); and

- In yet another alternative, sensing a talk condition can involve simply measuring a predetermined period after a phone call starts (paragraph [0016]).

In paragraph [0018], Perez states that "[p]ower for the light sources can be reduced or turned off either immediately upon detection of a talk condition or within a predetermined time as may be programmed into the portable communication device 10." Thus, in Perez, although several different ways of detecting a "talk condition" are disclosed, the detection of only a single "talk condition" is used to reduce display power. Claim 21 recites that power is reduced to the display if two separate and distinct conditions are true, i.e., (i) if a telephone call is determined to be active, and (ii) if the proximity of an external object is indicated. Since Perez fails to disclose display-power reduction based on these two separate and distinct conditions, Perez cannot anticipate claim 21. For similar reasons, the Applicant submits that claim 28 is also allowable over Perez. Since claims 22-27 and 29-33 depend variously from claims 21 and 28, it is further submitted that those claims are also allowable over Perez.

Claims 23 and 30

Claim 23 recites, *inter alia*, that "if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered." In rejecting claim 23 as obvious over Perez and Her in paragraph 10 of the action, the Examiner admits that Perez does not disclose these features and alleges that Her "discloses a vigoursely well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50)" (sic). The Examiner concludes that "[t]herefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54)" (sic).

Perez is concerned with conserving battery life in a wireless, mobile, hand-held telephone communications device, while Her deals with a wired, hands-free telephone communications device employing a speakerphone coupled to a line-interface unit (LIU) electrically interfaced with a telephone line (Her, at col. 3, lines 47-50). One skilled in the art of power conservation in a mobile device, e.g., when the hand-held mobile device is brought to the ear of a user, would not turn for guidance to Her, which is specifically concerned with eliminating the need for the user of a hardwired, stationary, hands-free speakerphone to have to approach the speakerphone and press a button to answer an incoming call

(Her, at col. 2, lines 35-38). Thus, contrary to the Examiner's assertion that Her is in "an analogous field of endeavor" to Perez, Her is not at all in an analogous field, and these references are not properly combinable to reject claim 23 as obvious. Therefore, claim 23 is allowable over Perez and Her. For similar reasons, the Applicant submits that claim 30 is also allowable over Perez and Her.

Claims 27 and 33

Claim 27 recites, *inter alia*, that "the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call." In rejecting claim 27 as obvious over Perez and Her in paragraph 10 of the action, the Examiner alleges that "it is obvious that the proximity sensor begins detecting (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call (that is when by depressing a key manually activating an out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020])" (sic). Contrary to the Examiner's assertions, this feature is not at all obvious. The cited portions of Perez to which the Examiner refers as supporting this rejection are set forth below:

Page 2, Paragraph [0019]:

> [0019] In one particular embodiment as shown in FIG. 3, the sensor or sensors 100 can comprise the earpiece 22, the microphone 24, a coder/decoder 104 and a digital signal processor (DSP) 102. The sensor 100 can utilize an acoustic feedback algorithm that measures at least a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to the earpiece 22 of the portable communication device. The sensor 100 can also be used to control the outbound audio quality or provide a constant audio level (from the perspective of the user) by automatically adjusting the audio level based on the proximity to the ear of the user. This automatic adjustment can additionally lower the power consumption by the audio coder/decoder 104.

Page 3, Lines 14-23 of Paragraph [0020]

> Next, at decision block 58, it is determined if a key on the keypad is depressed by the user, if a predetermined device angle or other motion is detected or if a break in audio is detected. The conditions in decision 58 can typically be conditions indicative that a talk condition is at least temporarily finished. If a keypad is depressed, it should be determined what kind of key was depressed. If the key is a power off key at decision block 59, then the lighting sources remain in their current state (off) as the radio powers down at step 62.

In paragraph [0019], Perez mentions "outbound audio quality," i.e., the quality of the audio signal being provided to the user through the earpiece of the phone. However, as can clearly be seen from the above-cited portions of Perez, neither portion has anything to do with outgoing telephone calls at all, let alone the initiation of outgoing calls. Neither of these cited portions discloses or even suggests the features recited in claim 27, namely, that "the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call." Nor does Her supply these missing teachings. Therefore, claim 27 is allowable over Perez and Her. For similar reasons, the Applicant submits that claim 33 is also allowable over Perez and Her.

New Claims 34-37

On 4/13/07, the Examiner participated in a telephonic interview with the Applicant's attorney Kevin Drucker. The Applicant thanks the Examiner for the courtesy of that interview. During the interview, the Examiner indicated that the Applicant could probably overcome the cited references, if the Applicant combined the features of claims 28, 29, and 33 into a new claim and made three other changes: (i) adding the phrase, "or receiving an incoming telephone call" (as supported by specification, e.g., at p. 3, lines 19-20) at the end of claim 33 prior to combining these claims; (ii) adding the limitation "mobile" or "wireless" to the phrase "telephone call" in the combined claim; and (iii) changing "a telephone call" to "the telephone call" in claim 29 before combining these claims. The Examiner then indicated that the Applicant could further define over the cited references by adding claim 30 to the combination of claims 28, 29, and 33. The Examiner said that claims 21, 22, and 27 could be combined similarly to overcome the cited references, and then claim 23 could further be added to this combination. Accordingly, the Applicant has added new claims 34-37, which find support in the following original claims:

New Claim	Support Found in Original Claim(s)
34	22 and 27
35	23
36	29 and 33
37	30

Based on the Examiner's Interview, it is believed that claims 34-37 are allowable over the cited references.

New Claims 38-39

New claim 38 recites that "the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station receiving an incoming telephone call." Support is found in the specification, e.g., at p. 3, lines 19-20. Adding this feature to new claims 34 and 36 was proposed by the Examiner, as discussed above, and the Applicant believes that new claim 38 is allowable over the cited references, because none of the cited references discloses beginning detection of an external object when an incoming call is received. For example, as discussed above with reference to claims 21-33, in Perez, although several different ways of detecting a "talk condition" are disclosed, the detection of only a single "talk condition" is used to reduce display power. New claim 38 recites that the detection of an external object begins when an incoming call is received. Thus, there are two separate conditions that are fulfilled before power is reduced to the display, i.e., (i) if an incoming telephone call arrives, and (ii) if the proximity of an external object is indicated. Since Perez fails to disclose display-power reduction based on these two separate and distinct conditions, Perez cannot anticipate claim 21. Nor do any of the other cited references supply these missing teachings. Therefore, new claim 38 is allowable over the cited references. For similar reasons, the Applicant submits that claim 39 is also allowable over the cited references.

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

Date: 04/30/2007

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

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

Office Action Summary	Application No. 11/516,316	Applicant(s) GORIS ET AL.
	Examiner Kamran Afshar, 571-272-7796	Art Unit 2617

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *30 April 2007*.

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) *21-39* 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) *21-39* 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 *30 April 2007* 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/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 04/30/2007 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e. power reduction based on two separate and distinct condition i.e. if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object, See e.g. Page 9, ¶ [0018]). Examiner very kindly directs the Applicant to Page 2 Paragraph [0014], as Perez discloses the talk condition should generally be understood as the condition when a user is on an active call (See e.g. Page 2, ¶ [0014], that is when the mobile station (MS) inherently receiving incoming phone call, or MS inherently placing an out going call by keying / dialing the number on the keypad and speaking into the microphone or listening to the earpiece, Page 2, ¶ [0015]). The determination is being done by the processor (See Page 1, ¶ [0013]). And the signal indicates the proximity of the external object (See e.g. signal, Page 1,¶ [0012], a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24 as further detailed with respect to FIG. 3, Page 2, ¶ [0015]). Further more, A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (for the keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display). Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]. Therefore, it is believed that Perez does disclose each and every element of independent claims 21 and 28. As such Perez is an anticipating reference to Claims 21, 28 and Claims dependent thereon.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, in an analogous field of endeavor, Her discloses a vigorously well known concept of a system and or method that a proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54). Therefore it is analogous, and the previous rejection is maintained.

Regarding obviousness Double-Patenting rejection, Applicant argues that, if necessary, a terminal disclaimer will be filed. In Response, the Double patenting rejection will be withdrawn upon a proper Terminal Disclaimer is filed. Therefore, the previous Double-patenting rejection is maintained.

Claim Objections

2. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claim 35 depending from claim 28 has been renumbered to claim 36.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226

(Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 21-39 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 7,113,811 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same subject matter which includes: 1) A mobile station, 2) a display, 3) reduce power to the display, 4) the microprocessor determines that a telephone call, 4) external object.

"A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or **anticipated by**, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651 (affirming a holding of obviousness-type double patenting because the claims at issue were obvious over claims in four prior art patents); In re Berg, 140 F.3d at 1437, 46 USPQ2d at 1233 (Fed. Cir. 1998) (affirming a holding of obviousness-type double patenting where a patent application claim to a genus is anticipated by a patent claim to a species within that genus). " ELI LILLY AND COMPANY v BARR LABORATORIES, INC., United States Court of Appeals for the Federal Circuit, ON PETITION FOR REHEARING EN BANC (DECIDED: May 30, 2001).

Claim Rejections - 35 USC § 102

5. 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 20-22, 24-26, 28-29, 31-32 and 38-39 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

Regarding, claim 20, Perez discloses the proximity sensor is activated manually (i.e. key-activity, talk condition, pressing / depressing the key or button, Page 2, ¶ [0017]) when the mobile station initiates an outgoing wireless telephone (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

With respect to claims 21, 28, Perez discloses a method of conserving battery power in a mobile station / a mobile station See i.e. radio communication apparatus, Title, Abstract), comprising: a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); a proximity sensor adapted to generate a signal indicative of proximity of an external object (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]); and a microprocessor adapted to (See e.g. 16 of Fig. 1, Page 1, ¶ [0013, 102 of Fig. 3, Page , 2 ¶ [0019]): (a) determine whether a telephone call is active (Se e.g. sensor can be used for detecting a user condition of the portable communication device such as a talk condition when the user is assumed to be talking on the portable communication device and the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]); (b) receive the signal from the proximity sensor (See e.g. signal, Page 1,¶ [0012]); and (c) reduce power to the display if (See e.g. reduce power, display, Page 1 ¶ [0013]) (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims 22, 29, Perez discloses (See e.g. the microprocessor the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]) reduces power to the display (See e.g. reduce power, display, Page 1 ¶ [0013]) only if (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims 24, 31, Perez discloses the proximity sensor causes display to be turned off / the display (See e.g. 56 of Fig. 2).

Regarding claims 25, 32 Perez discloses a mechanical proximity sensor, an optical sensor, and a range-detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claim 26, Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claims 38-39, Perez discloses detecting whether an external object is proximate substantially concurrently (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]) with the mobile station receiving an incoming telephone call (See e.g. when the mobile station (MS) inherently receiving incoming phone call, or MS inherently placing an out going call by keying / dialing the number on the keypad and speaking into the microphone or listening to the earpiece, Page 2, ¶ [0015]).

Claim Rejections - 35 USC § 103

7. 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.

8. Claims 23, 27, 30, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Her (U.S. Patent 5,712,911).

With respect to claims 23, 30, Perez discloses everything as discussed above in the rejected claims 21, 28. However, Perez dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered. In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Regarding claims 27, 33, it is obvious that the proximity sensor begins detecting (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call (that is when by depressing a key manually activating and out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020]).

Allowable Subject Matter

9. Claims 34-37 are objected to as being dependent upon a rejected base claim, but would be allowable if a proper terminal disclaimer filed and rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. **THIS ACTION IS MADE FINAL.** 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 mailing date of this final action.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

Kamran Afshar

GEORGE ENG
SUPERVISORY PATENT EXAMINER

CUSTOMER NO. 46900 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. Goris 10-10

In re application of: Norman Goris et al.

Serial No.:	11/516,316	Group Art Unit:	2617
Filed:	9/6/06	Examiner:	Kamran Afshar
Matter No.:	992.1313		

For: System and Method for Conserving Battery Power in a Mobile Station

AMENDMENT UNDER 37 CFR 1.116

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

Dear Sir:

This Amendment is filed in response to the final office action of 7/19/07.

CLAIMS

1-20. (Cancelled)

21. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of proximity of an external object; and

a microprocessor adapted to:

(a) determine whether a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object;

wherein:

the telephone call is a wireless telephone call;

the microprocessor reduces power to the display while the signal indicates the proximity of the external object only if the microprocessor determines that the wireless telephone call is active; and

the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless telephone call.

22. (Previously Presented) The mobile station of claim 21, wherein the microprocessor reduces power to the display only if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

23. (Previously Presented) The mobile station of claim 21, wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

24. (Previously Presented) The mobile station as recited in claim 21, wherein the microprocessor reduces power to the display by turning off the display.

25. (Previously Presented) The mobile station as recited in claim 21, wherein the proximity

sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

26. (Previously Presented) The mobile station as recited in claim 21, wherein the proximity sensor is located proximate to the display.

27. (Cancelled)

28. (Currently Amended) A method of conserving battery power in a mobile station, comprising:

detecting whether an external object is proximate;

determining whether a telephone call is active; and

reducing power consumption of a display of the mobile station if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected;

wherein:

the telephone call is a wireless telephone call;

the power consumption of the display is reduced while the proximity of the external object is detected only if the wireless telephone call is determined to be active; and

detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing wireless telephone call or receiving an incoming wireless telephone call.

29. (Previously Presented) The method of claim 28, wherein the power consumption of the display is reduced only if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected.

30. (Previously Presented) The method of claim 28, further comprising:

if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then automatically answering the incoming telephone call.

31. (Previously Presented) The method as recited in claim 28, wherein reducing power consumption of the display comprises turning off the display.

32. (Previously Presented) The method as recited in claim 28, wherein the detecting of the

proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

33-34. (Cancelled)

35. (Currently Amended) The invention of claim 21 ~~34~~, wherein, if (i) the microprocessor determines that the incoming wireless telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming wireless telephone call is automatically answered without any further action by the user.

36. (Cancelled)

37. (Currently Amended) The method of claim 28 ~~36~~, further comprising:

if (i) the incoming wireless telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then automatically answering the incoming wireless telephone call without any further action by the user.

38-39. (Cancelled)

REMARKS/ARGUMENTS

Claims 21-39 were previously pending in the application. Claims 21, 28, 35, and 37 are amended herein, and claims 27, 33, 34, 36, 38, and 39 are cancelled herein. Assuming entry of this amendment, claims 21-26, 28-32, 35, and 37 are now pending. The Applicant hereby requests examination of the application in view of the foregoing amendments and these remarks.

Double-Patenting Rejections

In paragraph 4 of the action, the Examiner rejected claims 21-39 on the ground of nonstatutory obviousness-type double patenting as unpatentable over claims 1-20 of U.S. Patent No. 7,113,811. In response, the Applicant submits herewith a terminal disclaimer, which is believed to overcome the double-patenting rejections.

Art Rejections

In paragraph 6 of the action, the Examiner rejected claims 20-22, 24-26, 28-29, 31-32, and 38-39 under 35 U.S.C. §102(e) as anticipated by U.S. Patent Application Pub. No. 2004/0225904 A1 ("Perez").

In paragraph 8 of the action, the Examiner rejected claims 23, 27, 30, and 33 under 35 U.S.C. §103(a) as obvious over Perez in view of U.S. Patent No. 5,712,911 ("Her").

In paragraph 9, the Examiner objected to claims 34-37 as being dependent upon a rejected base claim, but indicated that these claims would be allowable if rewritten in independent form and if a proper terminal disclaimer is filed.

For the following reasons, the Applicant submits that all of the now-pending claims are allowable over the cited references.

Claim 21 has been amended to include the recitations of previously-pending, now-cancelled claim 34 (and claim 35 has been amended to depend now from claim 21). As such, claim 21 is equivalent to previously-pending claim 34 rewritten in independent form. Since previously-pending claim 34 was indicated as allowable, the Applicant submits that claim 21 is allowable. Since claims 22-26 and 35 depend variously from claim 21, it is further submitted that those claims are also allowable.

Claim 28 has been amended to include the recitations of previously-pending, now-cancelled claim 36 (and claim 37 has been amended to depend now from claim 28). As such, claim 28 is equivalent to previously-pending claim 36 rewritten in independent form. Since previously-pending claim 36 was indicated as allowable, the Applicant submits that claim 28 is allowable. Since claims 29-32 and 37 depend variously from claim 21, it is further submitted that those claims are also allowable.

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

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UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

46900 7590 10/11/2007

MENDELSOHN & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 10/11/2007

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/516,316	09/06/2006	Norman Goris	GORIS 10-10	9565

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$300	$0	$1740	01/11/2008

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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Alexandria, Virginia 22313-1450
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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.

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46900 7590 10/11/2007

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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.

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/516,316	09/06/2006	Norman Goris	GORIS 10-10	9565

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$300	$0	$1740	01/11/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
AFSHAR, KAMRAN	2617	455-574000

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

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

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

2. For printing on the patent front page, list

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

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

1 ______
2 ______
3 ______

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

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

(A) NAME OF ASSIGNEE

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

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

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

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

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

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

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

☐ 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).

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.
11/516,316	09/06/2006	Norman Goris	GORIS 10-10	9565

46900 7590 10/11/2007

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EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 10/11/2007

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 0 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 0 day(s).

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

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

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

Notice of Allowability	**Application No.** 11/516,316	**Applicant(s)** GORIS ET AL.	
	Examiner Kamran Afshar, 571-272-7796	**Art Unit** 2617	

-- ***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 *09/19/2007*.
2. ☒ The allowed claim(s) is/are *21-26, 28-32, 35 and 37*.
3. ☐ 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.

4. ☐ 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.
5. ☐ 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).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date ______
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date ______ .
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other ____.

George Eng
GEORGE ENG
SUPERVISORY PATENT EXAMINER

DETAILED ACTION

Allowable Subject Matter

1. In view of the Terminal Disclaimer and the Amended claim(s), Claims 21-26, 28-32, 35 and 37 are allowed.

The following is an examiner's statement of reasons for allowance: 21-26, 28-32, 35 and 37.

Claims 21-26, 28-32, 35 and 37 are allowed for the reasons as set forth in the previous action mailed 07/19/2007.

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

Conclusion

2. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Bahl (U.S. Pub. No.: 2003/0197597 A1).

b) Lunsford (U.S. 6,665,803 B2).

c) Lin (U.S. Pub. No.: 2006/0284848 A1).

d) Bahl (U.S. Pub. No.: 2006/0019724 A1).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

Kamran Afshar

GEORGE ENG
SUPERVISORY PATENT EXAMINER

EXHIBIT C

U 7689668

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

August 14, 2018

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF:

U.S. PATENT: *8,204,554*
ISSUE DATE: *June 19, 2012*

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

John A. B

JOHN A BURSON
Certifying Officer

US008204554B2

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

(10) **Patent No.: US 8,204,554 B2**
(45) **Date of Patent: *Jun. 19, 2012**

(54) **SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION**

(75) Inventors: **Norman Goris**, Dortmund (DE); **Wolfgang Scheit**, Rothenbach (DE)

(73) Assignee: **Agere Systems Inc.**, Allentown, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 448 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/945,505**

(22) Filed: **Nov. 27, 2007**

(65) **Prior Publication Data**

US 2008/0070639 A1 Mar. 20, 2008

Related U.S. Application Data

(63) Continuation of application No. 11/516,316, filed on Sep. 6, 2006, now Pat. No. 7,319,889, which is a continuation of application No. 10/463,630, filed on Jun. 17, 2003, now Pat. No. 7,113,811.

(51) **Int. Cl.**
H04M 1/00 (2006.01)

(52) **U.S. Cl.** **455/574**; 455/566; 455/41.2; 455/572; 455/556.1

(58) **Field of Classification Search** 455/550.1, 455/41.2, 566, 572–574, 575.1, 343.1–343.5, 455/418; 345/211, 156, 166, 169; 713/230; 340/7.32, 539.23, 539.26, 539.3
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,224,151	A	6/1993	Bowen et al.	379/58
5,586,182	A *	12/1996	Miyashita	455/566
5,684,294	A	11/1997	Kouhi	
5,712,911	A *	1/1998	Her	379/388.01
5,881,377	A	3/1999	Giel et al.	455/343
5,884,156	A	3/1999	Gordon	455/350
6,246,862	B1	6/2001	Grivas et al.	455/90
6,265,833	B1	7/2001	Kim et al.	315/169.3
6,278,887	B1	8/2001	Son et al.	455/566
6,330,457	B1	12/2001	Yoon	455/550

(Continued)

FOREIGN PATENT DOCUMENTS

DE 195 37 224 A1 4/1997

(Continued)

OTHER PUBLICATIONS

Office Action received in JP 2004-179016 (Mailing date: Apr. 1, 2009).

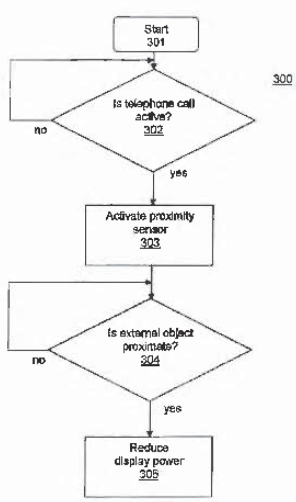
(Continued)

Primary Examiner — Kamran Afshar
Assistant Examiner — Kathy Wang-Hurst
(74) *Attorney, Agent, or Firm* — Mendelsohn, Drucker & Associates, P.C.; Kevin M. Drucker; Steve Mendelsohn

(57) **ABSTRACT**

In one embodiment, a mobile station including a chassis having a display, a power reducer, a proximity sensor, and a microprocessor. The power reducer controls power consumption of the display. The proximity sensor is coupled to the chassis and causes the power consumption to be reduced when the display is within a predetermined range of an external object. The microprocessor is coupled to the proximity sensor and to the display and automatically activates the proximity sensor based on the mobile station receiving an incoming wireless telephone call.

14 Claims, 4 Drawing Sheets



U.S. PATENT DOCUMENTS

6,631,192 B1	10/2003	Fukiharu		
6,665,803 B2	12/2003	Osborn et al.		713/320
6,684,294 B1	1/2004	Huffman		711/112
6,726,099 B2	4/2004	Becker et al.		235/380
D493,451 S	7/2004	Wada		D14/247
6,836,212 B2	12/2004	Sawinski		340/539.23
6,853,850 B2	2/2005	Shim et al.		455/550.1
7,076,675 B2 *	7/2006	Martinez Perez et al.		455/566
7,113,811 B2 *	9/2006	Goris et al.		455/574
7,248,899 B2	7/2007	Ozaki et al.		
7,319,889 B2 *	1/2008	Goris et al.		455/574
2002/0084998 A1	7/2002	Sawada		345/211
2002/0177475 A1	11/2002	Park		455/574
2003/0036412 A1	2/2003	Chong		455/566
2003/0162570 A1 *	8/2003	Suzuki et al.		455/566
2003/0197597 A1	10/2003	Bahl et al.		340/7.58
2004/0097261 A1	5/2004	Ujii		455/556.1
2004/0198458 A1	10/2004	Kawamura		455/566
2004/0225904 A1	11/2004	Perez et al.		713/320
2004/0252115 A1	12/2004	Boireau		345/211
2006/0019724 A1	1/2006	Bahl et al.		455/574
2006/0284848 A1	12/2006	Lin		345/169

FOREIGN PATENT DOCUMENTS

JP	2000106598 A	4/2000
JP	2000307719 A	11/2000
JP	2000341376 A	12/2000
JP	2001352395 A	12/2001
JP	2002111801 A	4/2002
JP	2003032357 A	1/2003

OTHER PUBLICATIONS

Response to Rule 312 Communication received in U.S. Appl. No. 10/463,630, filed Jun. 17, 2003 dated, Jul. 27, 2006.

Notice of Allowance and Fee(s) Due received in U.S. Appl. No. 10/463,630, filed Jun. 17, 2003 dated Apr. 21, 2006.

Office Action received in U.S. Appl. No. 10/463,630, filed Jun. 17, 2003 dated Nov. 17, 2005.

Final Office Action received in U.S. Appl. No. 10/463,630, filed Jun. 17, 2003 dated Jul. 11, 2005.

Office Action received in U.S. Appl. No. 10/463,630, filed Jun. 17, 2003 dated Feb. 23, 2005.

Notice of Allowance and Fee(s) Due received in U.S. Appl. No. 11/516,316, filed Sep. 6, 2006 dated Oct. 11, 2007.

Final Office Action received in U.S. Appl. No. 11/516,316, filed Sep. 6, 2006 dated Jul. 19, 2007.

Office Action recieved in U.S. Appl. No. 11/516,316, filed Sep. 6, 2006 dated Jan. 29, 2007.

German Office Action; Mailed Mar. 6, 2012 for corresponding DE Application No. 10 2004 028 259.

* cited by examiner

FIGURE 1

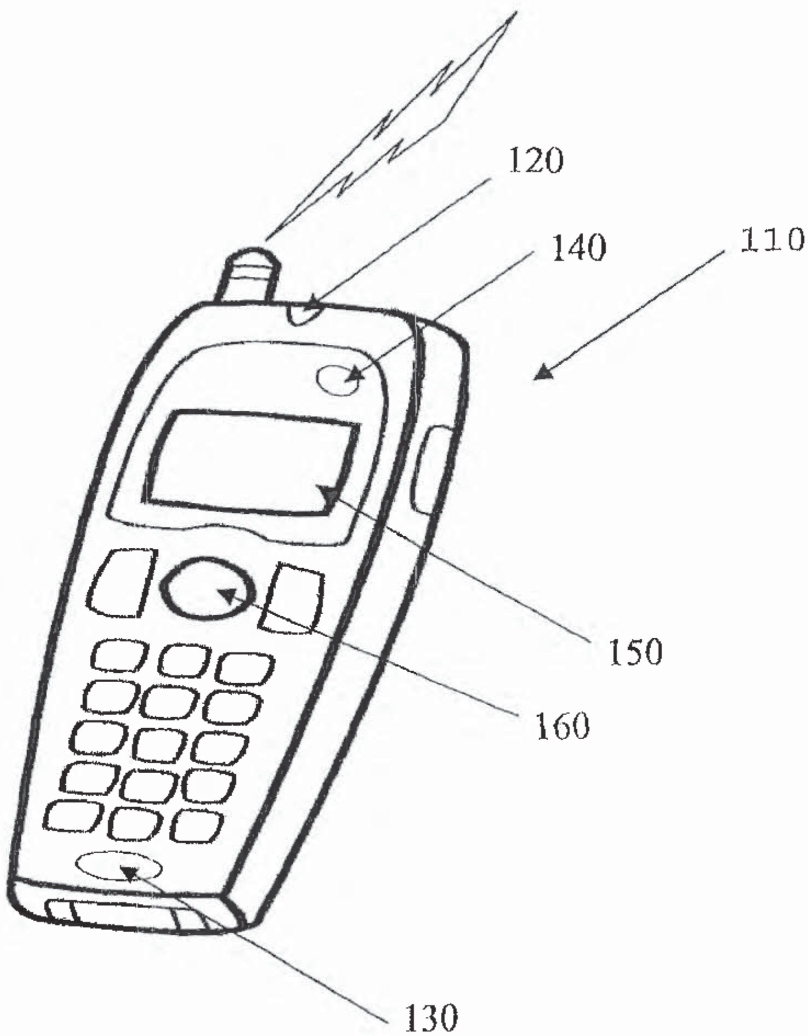
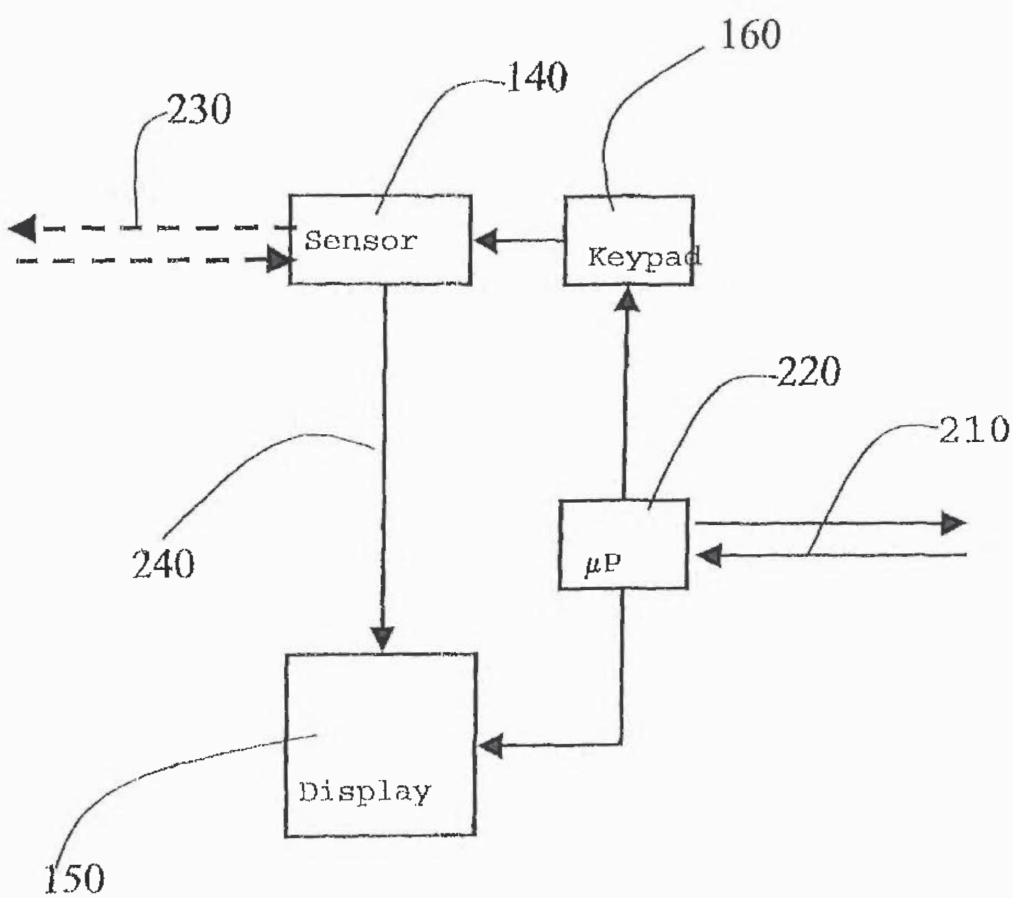


FIGURE 2



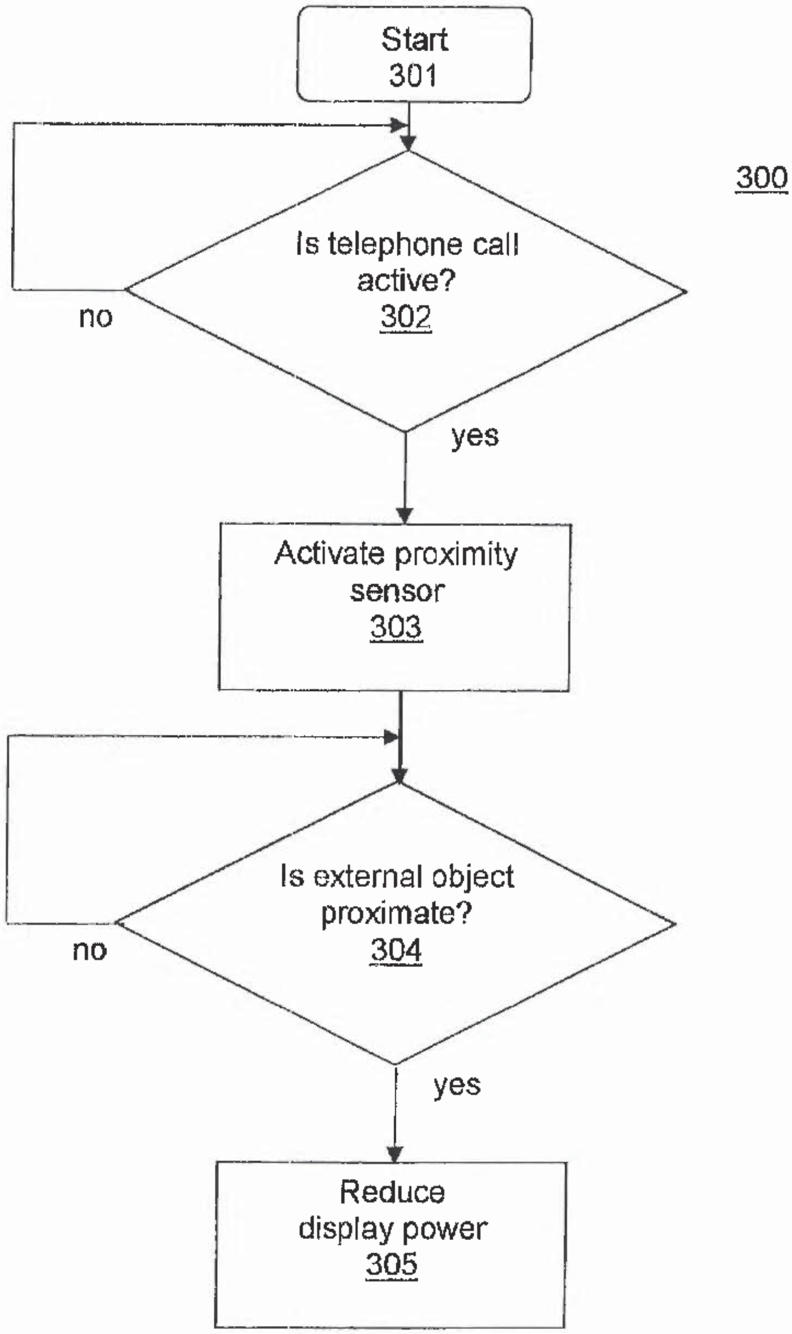

Start
301
300
Is telephone call active?
302
no
yes
Activate proximity sensor
303
Is external object proximate?
304
no
yes
Reduce display power
305

FIGURE 3

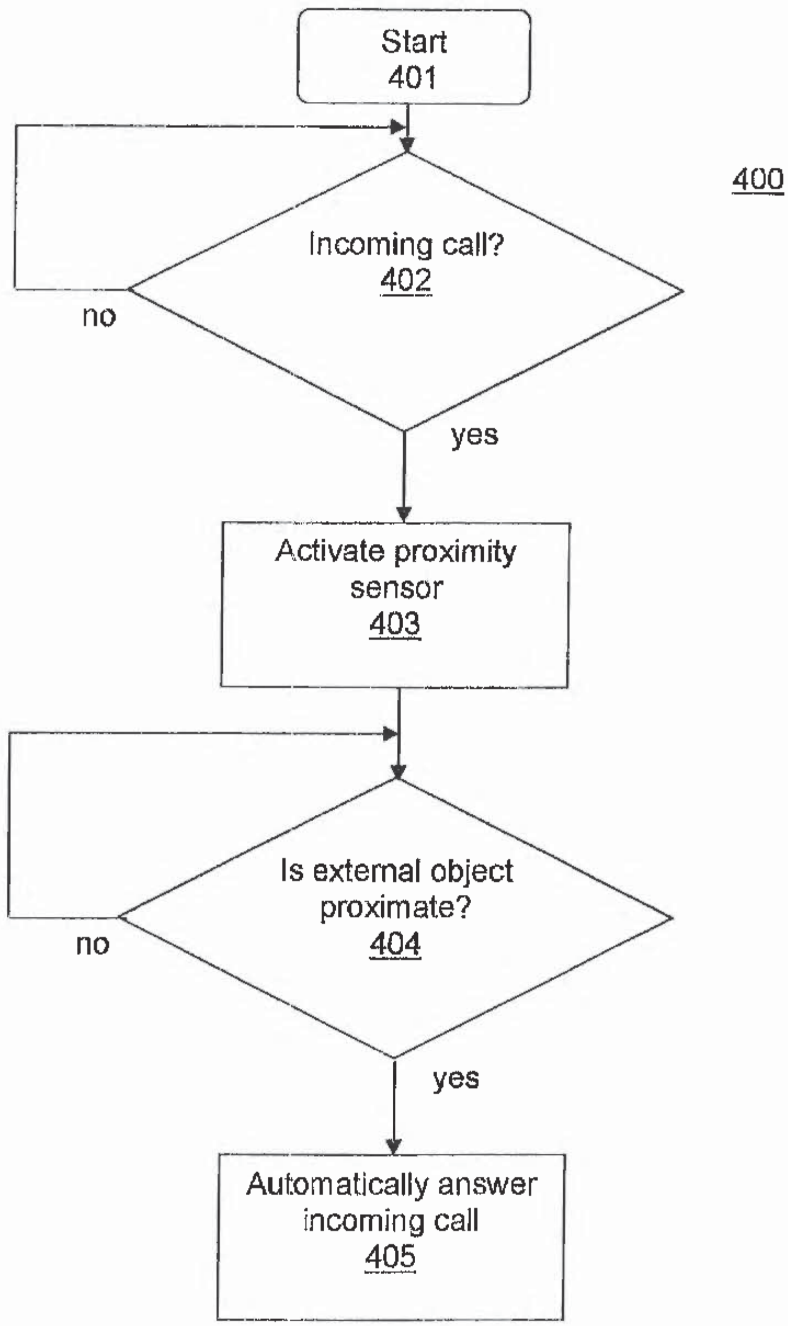

Start
401
400
Incoming call?
402
no
yes
Activate proximity sensor
403
Is external object proximate?
404
no
yes
Automatically answer incoming call
405

FIGURE 4

SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. application Ser. No. 11/516,316, filed on Sep. 6, 2007, which is a continuation of U.S. application Ser. No. 10/463,630, filed on Jun. 17, 2003, the teachings of both of which are incorporated herein by reference.

TECHNICAL FIELD OF THE INVENTION

The present invention is directed, in general, to mobile stations and, more specifically, to a mobile station of mobile radio system having a reduced power consumption under certain operating conditions.

BACKGROUND OF THE INVENTION

Mobile stations have found many uses in today's world. When paired with a single base station located at a user's own premises, they are called "cordless telephones." When they interact with various, geographically distributed cellular base stations, they are called "cellular telephones" or simply "cell phones."

Usually the stand-by time, as well as the talk-time, of a mobile station depend on the lifetime of a (rechargeable) battery inserted within the mobile station and hence, on the load and/or on the capacity of the battery.

Increasing of the capacity of the battery would increase the lifetime of the mobile station, but batteries having increased capacities are often larger, heavier or more expensive, none of which are desirable attributes for a portable, affordable mobile station. Accordingly, what is needed in the art is a way to prolong the lifetime of a mobile station without having to use a battery with an increased capacity.

SUMMARY OF THE INVENTION

To address the above-discussed deficiencies of the prior art, the present invention provides a mobile station, including: (1) a chassis having a display and (2) a proximity sensor coupled to the chassis and adapted to cause a power consumption of the display to be reduced when the display is within a predetermined range of an external object.

Thus, by reducing the power consumption of the display of an activated telephone set in case the display is not needed, i.e., in particular during a telephone call, current is saved instead of needlessly consumed from the (rechargeable) battery. Accordingly, the spared available battery power may be significant, especially for color displays, resulting in an overall increasement of the stand-by and/or talk time of the telephone set.

According to preferred embodiments the means are adapted to switch-off the display in response to a detection that the set, preferably the display of the set, is attached near to an object, in particular to the ear.

As a consequence, if a call for example is incoming for example, possibly the user wants to see by means of the display the number and/or the stored name of the calling party. However, if the user wants to accept the call and hence is attaching the telephone set to the ear, the invention enables that the display is switched off. In a similar way, in case the user is trying to call a third party he may want to have a look at the display for verifying the entered number, but when the

call is established he is likewise attaching the set and accordingly the display to his ear for performing the call. On the other hand, as long as the telephone set is inside a pocket, for example, it is not necessary to keep the display in an on-condition or to indicate the number and/or the name of a calling party.

Moreover, the means may be further adapted to switch-on the display in response to a detection that the set, preferably the display of the set, is moved away from any object, in particular from the ear.

As an alternative or in addition, the triggering event for current saving purposes may also be selectable by the user, for example via a menu list. According to further preferred refinements, the proximity sensor is proposed to be a heat flow or temperature sensor, an optical or infrared sensor, or a load sensor. However, as a further advantage, basically any kind of proximity sensor which is capable of observing a close range or small distance may be used.

Correspondingly, the invention proposes a method for saving available battery power of a mobile station, in particular of a mobile station comprising the steps of detecting an attachment of the set, in particular of the display of said set near to an object, in particular to the ear, and switching off the display in response to such a detection in case the display is in an on-condition.

The foregoing has outlined, rather broadly, preferred and alternative features of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they can readily use the disclosed conception and specific embodiment as a basis for designing or modifying other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIG. **1** schematically depicts a preferred embodiment of a mobile station having the inventive detection functionality;

FIG. **2** schematically depicts a block diagram showing essential components of the invention;

FIG. **3** is a flow diagram of exemplary steps for reducing power to a display; and

FIG. **4** is a flow diagram of exemplary steps for automatically answering an incoming call.

DETAILED DESCRIPTION

FIG. **1** illustrates a mobile station **110** of a mobile radio telecommunication system having a loudspeaker **120** and a microphone **130**. A proximity sensor **140** is located near a display **150** toward a side of the loudspeaker **120**. A keypad **160** allows a user (not shown) to establish an outgoing call, accept an incoming call and/or terminate an active call. However, it should be apparent to one skilled in the pertinent art, that these functionalities can be also performed by other control means, for example by speech control. The proximity sensor **140** is integrated within the mobile station **110** to enable a functionality as described in more detail with regard to FIG. **2**.

As can be seen from FIG. 2, an incoming call may be managed by a central processing unit **220**, for example for further specific processing. For example, the number or the name of the calling party stored within a storage (not referenced) implemented within the mobile station **110** can be depicted at the display **150**.

If the user of the mobile station **110** wants to accept the incoming call **210**, he may press a key on the keypad **160** or issue a voice command. Alternatively, an incoming call may directly activate the proximity sensor **140** without the necessity of pressing a key on the keypad **160** to accept the call.

In response to the acceptance of the incoming call **210** or automatically, the proximity sensor **140** is activated to monitor a proximity **230** to an external object (not shown), for example a range of about five centimeters. This is preferably done by a standard low-cost proximity sensor, for example a thermal sensor. However, other proximity sensors, such as conventional mechanical proximity (load) sensors, optical sensors or range detecting sensors, fall within the broad scope of the present invention. If the proximity sensor **140** detects an external object (such as the user's ear) within the monitored range, the power consumption of the display **150** is reduced, most preferably by switching the display **150** completely off, as indicated by an arrow **240**, to spare battery power during the telephone call.

When the telephone call **210** is finished, the user of the mobile station **110** typically moves the mobile station **110** away from his ear. This causes the proximity sensor **140** to move out of range of the external object (in this case the user's ear). Accordingly, in response thereto, the display **150** is switched back on, enabling the user to look at information on the display **150**.

Correspondingly, for an outgoing call, the proximity sensor **140** is activated by pressing a key on the keypad **160** to establish the outgoing call to a third party. As long as the outgoing call remains in effect and the proximity sensor **140** detects proximity to an external object, e.g., the ear of the user, the display **150** remains in a state of reduced power consumption, or off, as the case may be.

The function of switching the display off or on or otherwise reducing the amount of power the display consumes may comprise hardware and/or software components. For example, electronically readable instructions executable in the central processing unit **220** may be stored on a memory chip located in the mobile station **110** and adapted to cooperate with the proximity sensor **140** to perform the function.

Moreover, if the proximity sensor **140** is directly activated by an incoming call or automatically activated, the display can be kept in a switched-off condition as long as the mobile station **110** is, for example, within a pocket (not referenced) or the like and is only switched on when the user retrieves the mobile station **110** from the pocket to enable the user to look on the display **150** for an information about the calling party. If the user then wants to accept the call and thence places the mobile station **110** proximate an external object, such as his ear, the proximity sensor **140** again detects an object, causing the display again to be switched off.

FIG. **3** illustrates exemplary steps for reducing power to a display, as described above, and FIG. **4** illustrates exemplary steps for automatically answering an incoming call, as described above.

Although the present invention has been described in detail, those skilled in the art should understand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the invention in its broadest form.

What is claimed is:

1. A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and

a microprocessor adapted to:

(a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call;

(b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor;

(c) receive the signal from the activated proximity sensor; and

(d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists.

2. The mobile station of claim **1**, further comprising increasing power to the display if the signal from the activated proximity sensor indicates that the first condition no longer exists.

3. The mobile station of claim **1**, wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

4. The mobile station as recited in claim **1**, wherein the microprocessor reduces power to the display by turning off the display.

5. The mobile station as recited in claim **1**, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

6. The mobile station as recited in claim **1**, wherein the proximity sensor is located proximate to the display.

7. The mobile station as recited in claim **1**, wherein the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call.

8. A method of conserving battery power in a mobile station, the mobile station adapted to detect the existence of a proximity condition, the proximity condition being that an external object is proximate, the method comprising:

the mobile station detecting the existence of an initiated-call condition or an answered-call condition independent and different from the proximity condition, the initiated-call condition being that a user of the mobile station has performed an action to initiate a call, and the answered-call condition being that a user of the mobile station has performed an action to answer a call;

the mobile station activating the proximity sensor in response to a determination that an answered-call condition or initiated-call condition exists; and

the mobile station reducing power consumption of a display of the mobile station if the activated proximity sensor indicates that the proximity condition exists.

9. The method of claim **8**, further comprising the mobile station increasing power consumption of the display if the signal from the activated proximity sensor indicates that the proximity condition no longer exists.

10. The method of claim **8**, further comprising:

if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then the mobile station automatically answering the incoming telephone call.

11. The method as recited in claim 8, wherein reducing power consumption of the display comprises turning off the display.

12. The method as recited in claim 8, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

13. The method as recited in claim 8, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing telephone call.

14. A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and

a microprocessor adapted to:

(a) determine, independently of the determination whether the external object is proximate, the existence of a second condition different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call;

(b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor;

(c) receive the signal from the activated proximity sensor; and

(d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists.

* * * * *

EXHIBIT D

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THE UNITED STATES OF AMERICA

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United States Patent and Trademark Office

August 13, 2018

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF THE FILE WRAPPER AND CONTENTS OF:

APPLICATION NUMBER: ***11/945,505***
FILING DATE: ***November 27, 2007***
PATENT NUMBER: ***8204554***
ISSUE DATE: ***June 19, 2012***

UNITED STATES PATENT AND TRADEMARK OFFICE
DEPARTMENT OF COMMERCE

Certified by

Andrei Iancu

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11/945,505	11/27/2007	Norman Goris	Goris 11-11	7512

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EXAMINER	
AFSHAR, KAMRAN	

ART UNIT	PAPER NUMBER
2617	

MAIL DATE	DELIVERY MODE
04/23/2010	PAPER

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

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

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 11/945,505	Applicant(s) GORIS ET AL.	
	Examiner KAMRAN AFSHAR	Art Unit 2617	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *27 November 2007*.

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) *1-13* 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) *1-13* 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 *11/27/2007* 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/SB/08) Paper No(s)/Mail Date *12/21/2007*.

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

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

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

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 1-13 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 7,113,811 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same subject matter which includes: 1) A mobile station, 2) a display, 3) a power reducer configured to control power consumption of said display, 4) a proximity sensor adapted generate a signal indicative of proximity of an external object , 5) a microprocessor adapted to: (a) determine whether a telephone call is active; (b) receive the signal from the proximity sensor; and (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

3. Claims 1-13 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Patent No. 7,319,889 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same subject matter which includes: 1) A mobile station, 2) a display, 3) a power reducer configured to control power consumption of said display, 4) a proximity sensor adapted generate a signal indicative of proximity of an external object , 5) a microprocessor adapted to: (a) determine whether a telephone call is active; (b) receive the signal from the proximity sensor; and

(c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

"A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or anticipated by, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651 (affirming a holding of obviousness-type double patenting because the claims at issue were obvious over claims in four prior art patents); In re Berg, 140 F.3d at 1437, 46 USPQ2d at 1233 (Fed. Cir. 1998) (affirming a holding of obviousness-type double patenting where a patent application claim to a genus is anticipated by a patent claim to a species within that genus). " ELI LILLY AND COMPANY v BARR LABORATORIES, INC., United States Court of Appeals for the Federal Circuit, ON PETITION FOR REHEARING EN BANC (DECIDED: May 30, 2001).

Claim Rejections - 35 USC § 102

4. 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

5. Claims 1-2, 4-9 and 11-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

Regarding, claim 20, Perez discloses the proximity sensor is activated manually (i.e. key-activity, talk condition, pressing / depressing the key or button, Page 2, ¶ [0017]) when the mobile station initiates an outgoing wireless telephone (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

With respect to claims **1, 8**, Perez discloses a method of conserving battery power in a mobile station / a mobile station See i.e. radio communication apparatus, Title, Abstract), comprising: a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); a proximity sensor adapted to generate a signal indicative of proximity of an external object (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]); and a microprocessor adapted to (See e.g. 16 of Fig. 1, Page 1, ¶ [0013, 102 of Fig. 3, Page , 2 ¶ [0019]): (a) determine whether a telephone call is active (Se e.g. sensor can be used for detecting a user condition of the portable communication device such as a talk condition when the user is assumed to be talking on the portable communication device and the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]); (b) receive the signal from the proximity sensor (See e.g. signal, Page 1,¶ [0012]); and (c) reduce power to the display if (See e.g. reduce power, display, Page 1 ¶ [0013]) (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims **2, 9**, Perez discloses (See e.g. the microprocessor the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]) reduces power to the display (See e.g. reduce power, display, Page 1 ¶ [0013]) only if (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims **4, 11**, Perez discloses the proximity sensor causes display to be turned off / the display (See e.g. 56 of Fig. 2).

Regarding claims **5, 12,** Perez discloses a mechanical proximity sensor, an optical sensor, and a range-detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claim **6,** Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claims **7, 13,** Perez discloses detecting whether an external object is proximate substantially concurrently (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]) with the mobile station receiving an incoming telephone call (See e.g. when the mobile station (MS) inherently receiving incoming phone call, or MS inherently placing an out going call by keying / dialing the number on the keypad and speaking into the microphone or listening to the earpiece, Page 2, ¶ [0015]).

Claim Rejections - 35 USC § 103

6. 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.

7. Claims 3, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Her (U.S. Patent 5,712,911).

With respect to claims 3, 10, Perez discloses everything as discussed above in the rejected claims 1, 8. However, Perez dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered. In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and

microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Suzuki (U.S. Pub. No.: 2003/0162570 A1).

b) Perez (U.S. 7,076,675 B2).

c) Miyashita (U.S. 5,586,182 A).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is **(571) 272-7796**. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

/KAMRAN AFSHAR/

Primary Examiner, Art Unit 2617

CUSTOMER NO. 46900 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. Goris 11-11

In re application of: Norman Goris et al.

Serial No.:	11/945,505	Group Art Unit:	2617
Filed:	11/27/07	Examiner:	Kamran Afshar
Matter No.:	992.1428	Phone No.:	571-272-7796

For: System and Method for Conserving Battery Power in a Mobile Station

AMENDMENT UNDER 37 CFR 1.111

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

Dear Sir:

This Amendment is filed in response to the non-final office action of 4/23/10.

CLAIMS

1. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of proximity of an external object; and

a microprocessor adapted to:

(a) determine, without using the proximity sensor, whether a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

2. (Original) The mobile station of claim 1, wherein the microprocessor reduces power to the display only if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

3. (Original) The mobile station of claim 1, wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

4. (Original) The mobile station as recited in claim 1, wherein the microprocessor reduces power to the display by turning off the display.

5. (Original) The mobile station as recited in claim 1, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

6. (Original) The mobile station as recited in claim 1, wherein the proximity sensor is located proximate to the display.

7. (Original) The mobile station as recited in claim 1, wherein the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call.

8. (Currently Amended) A method of conserving battery power in a mobile station,

comprising:

detecting whether an external object is proximate;

determining, independently of the determination whether the external object is proximate, whether a telephone call is active; and

reducing power consumption of a display of the mobile station if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected.

9. (Original) The method of claim 8, wherein the power consumption of the display is reduced only if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected.

10. (Original) The method of claim 8, further comprising:

if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then automatically answering the incoming telephone call.

11. (Original) The method as recited in claim 8, wherein reducing power consumption of the display comprises turning off the display.

12. (Original) The method as recited in claim 8, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

13. (Original) The method as recited in claim 8, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing telephone call.

14. (New) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of proximity of an external object; and

a microprocessor adapted to:

(a) determine, independently of the determination whether the external object is proximate, whether a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

REMARKS/ARGUMENTS

Claims 1-13 were previously pending in the application. Claims 1 and 8 are amended, and new claim 14 is added herein. Assuming entry of this amendment, claims 1-14 are now pending. The Applicant hereby requests examination of the application in view of the foregoing amendments and these remarks.

Double-Patenting Rejections

In paragraph 2 of the office action, the Examiner rejected claims 1-13 on the ground of nonstatutory obviousness-type double patenting as unpatentable over claims 1-20 of U.S. Patent No. 7,113,811. In paragraph 3 of the office action, the Examiner rejected claims 1-13 on the ground of nonstatutory obviousness-type double patenting as unpatentable over claims 1-13 of U.S. Patent No. 7,319,889. In response, the Applicant submits that, if necessary, a terminal disclaimer will be filed after indication of allowable subject matter in the present application.

Art Rejections

In paragraph 4 of the office action, the Examiner rejected claims 1, 2, 4-9, and 11-13 under 35 U.S.C. §102(e) as anticipated by U.S. Patent Application Pub. No. 2004/0225904 ("Perez"). In paragraph 6, the Examiner rejected claims 3 and 10 under 35 U.S.C. §103(a) as obvious over Perez in view of U.S. Patent No. 5,712,911 ("Her").

For the following reasons, the Applicant submits that all of the now-pending claims are allowable over the cited references.

Claim 1, as amended herein, recites:

> 1. A mobile station, comprising:
> a display;
> a proximity sensor adapted to generate a signal indicative of proximity of an external object; and
> a microprocessor adapted to:
> (a) determine, **without using the proximity sensor**, whether a telephone call is active;
> (b) receive the signal from the proximity sensor; and
> (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

Similarly, amended claim 8 and new claim 14 recite that the determination whether a telephone call is active is made "**independently of the determination whether the external object is proximate**." Support for the amendments to claims 1 and 8 and for new claim 14 is found in the specification, e.g., at p. 3, line 17, through p. 4, line 12.

The Examiner argued on page 5 of the action that Perez discloses a proximity sensor that "can be used for detecting a user condition of the portable communication device such as a talk condition when the user is assumed to be talking on the portable communication device and the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition." Perez provides a number of examples of how a "talk condition" can be detected:

- A talk condition, for example, can be sensed by detecting if a predetermined volume of acoustic sound is being received at the microphone 20 or at another sensor such as a proximity sensor 26 indicative of a user talking on the portable communication device (paragraph [0015]);

- Alternatively, a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24 (paragraph [0015]);

- A talk condition can also be sensed by detecting an angle at which the portable communication device 10 is positioned or by detecting a vibration of the portable communication device 10 (paragraph [0015]);

- Another way for sensing a talk condition can be achieved by sensing if the portable communication device 10 is in a user's hand (paragraph [0015]); and

- In yet another alternative, sensing a talk condition can involve simply measuring a predetermined period after a phone call starts (paragraph [0016]).

In paragraph [0018], Perez states that "[p]ower for the light sources can be reduced or turned off either immediately upon detection of a talk condition or within a predetermined time as may be programmed into the portable communication device 10." Thus, in Perez, although several different ways of detecting a "talk condition" are disclosed, the detection of only **a single condition, namely, a "talk condition,"** is used to reduce display power.

Amended claim 1 recites that the determination whether a telephone call is active is made "**without using the proximity sensor**," and amended claim 8 and new claim 14 recite that the determination whether a telephone call is active is made "**independently of the determination whether the external object is proximate**." Thus, claims 1, 8, and 14 all require that **two separate determinations** be made: (i) whether a telephone call is active, **and** (ii) whether the proximity of an external object is indicated.

Since Perez fails to disclose display-power reduction based on these two separate and distinct conditions, but rather, uses only a single condition to reduce display power, Perez cannot possibly anticipate any of claims 1, 8, and 14. Since the remaining claims depend variously from claims 1 and 8, it is further submitted that those claims are also allowable over Perez.

Conclusion

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Fees

During the pendency of this application, the Commissioner for Patents is hereby authorized to charge payment of any filing fees for presentation of extra claims under 37 CFR 1.16 and any patent application processing fees under 37 CFR 1.17 or credit any overpayment to Mendelsohn, Drucker, & Associates, P.C. Deposit Account No. 50-0782.

The Commissioner for Patents is hereby authorized to treat any concurrent or future reply, requiring a petition for extension of time under 37 CFR § 1.136 for its timely submission, as incorporating a petition for extension of time for the appropriate length of time if not submitted with the reply.

Respectfully submitted,

Date: July 20, 2010
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	Goris 11-11	7512

46900 7590 09/02/2010
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EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	**PAPER NUMBER**
2617	

MAIL DATE	DELIVERY MODE
09/02/2010	PAPER

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

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

Office Action Summary	Application No. 11/945,505	Applicant(s) GORIS ET AL.	
	Examiner KAMRAN AFSHAR	Art Unit 2617	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *20 July 2010*.

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) *1-14* 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) *1-14* 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/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 07/20/2010 have been fully considered but they are not persuasive.

Double-Patenting Rejections

In response to Applicant argument (i.e. the Applicant submits that, if necessary, a terminal disclaimer will be filed after indication of allowable subject matter in the present application. The **Double-Patenting Rejections is maintained till a suitable** terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) is filed to overcome an actual or provisional rejection based on a nonstatutory obviousness-type double patenting rejection.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Art Rejections

In response to applicant's argument with respect to amended claims 1, 8, and new claim 14 that the reference Perez (U.S. Pub. No.: 2004/0225904 A1) fails to show certain features of applicant's invention (i.e. the determination whether a telephone call is active is made "without using the proximity sensor," and or the determination whether a telephone call is active is made "independently of the determination whether the external object is proximate."). Examiner very kindly directs the Applicant to reference Perez: where teaches the determination whether a telephone call is active is made "without using the proximity sensor," and or the determination whether a telephone call is active is made "independently of the determination whether the external object is proximate" (See Perez e.g. A **talk condition** (or active call or ongoing call or during a call) can be sensed in quite a number of ways **(Emphases added)**, ¶ [0015], the **talk condition,** for example, can be sensed by detecting if a predetermined volume of acoustic sound is being received at the microphone 20 (which is not a proximity sensor or detector **(Emphases added)**). In yet another alternative, sensing a **talk condition** can involve simply measuring a predetermined period after a phone **call starts** (or active call or ongoing call or during a call). The predetermined time period can be user selectable and can be programmed **using the processor** 16 **(Emphases added)**, ¶ [0016]). In other word, in any of the above alternative talk condition determinations are without and or independent of the proximity detection via sensor 26 of Fig. 1 and or the determination is performed by the processor 16 **(Emphases added).**

Applicant(s) are reminded that the Examiner is entitled to give the broadest reasonable interpretation to the language of the claim. The Examiner is not limited to Applicant's definition, which is not specifically set fourth in the claims, *In re Tanaka et aL,* 193 USPQ 139, (CCPA) 1977. Therefore, the previous rejection is maintained.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140

F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-14 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 7,113,811 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same subject matter which includes: 1) A mobile station, 2) a display, 3) a power reducer configured to control power consumption of said display, 4) a proximity sensor adapted generate a signal indicative of proximity of an external object , 5) a microprocessor adapted to: (a) determine whether a telephone call is active; (b) receive the signal from the proximity sensor; and (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

4. Claims 1-14 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Patent No. 7,319,889 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same subject matter which includes: 1) A mobile station, 2) a display, 3) a power reducer configured to control power consumption of said display, 4) a proximity sensor adapted generate a signal indicative

of proximity of an external object , 5) a microprocessor adapted to: (a) determine whether a telephone call is active; (b) receive the signal from the proximity sensor; and (c) reduce power to the display if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

"A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or anticipated by, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651 (affirming a holding of obviousness-type double patenting because the claims at issue were obvious over claims in four prior art patents); In re Berg, 140 F.3d at 1437, 46 USPQ2d at 1233 (Fed. Cir. 1998) (affirming a holding of obviousness-type double patenting where a patent application claim to a genus is anticipated by a patent claim to a species within that genus). " ELI LILLY AND COMPANY v BARR LABORATORIES, INC., United States Court of Appeals for the Federal Circuit, ON PETITION FOR REHEARING EN BANC (DECIDED: May 30, 2001).

Claim Rejections - 35 USC § 102

5. 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 1-2, 4-9 and 11-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

With respect to claims **1, 8**, 14, Perez discloses a method of conserving battery power in a mobile station / a mobile station See i.e. radio communication apparatus, Title, Abstract), comprising: a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); a proximity sensor adapted to generate a signal indicative of proximity of an external object (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]); and a microprocessor adapted to (See e.g. 16 of Fig. 1, Page 1, ¶ [0013], 102 of Fig. 3, Page , 2 ¶ [0019]): (a) determine, without using the proximity sensor and or independently of the determination whether the external object is proximate (See e.g. A **talk condition** (or active call or ongoing call or during a call) can be sensed in quite a number of ways **(Emphases added)**, ¶ [0015], the **talk condition**, for example, can be sensed by detecting if a predetermined volume of acoustic sound is being received at the microphone 20 (which is not a proximity sensor or detector **(Emphases added)**). In yet another alternative, sensing a **talk condition** can involve simply measuring a predetermined period after a phone **call starts** (or active call or ongoing call or during a call). The predetermined time period can be user selectable and can be programmed **using the processor** 16 talk condition determinations are without and or independent of the proximity detection via sensor 26 of Fig. 1 and or the determination is performed by the processor 16 **(Emphases added)** whether a telephone call is active (Se e.g. sensor can be used for detecting a user condition of the portable communication device such as a talk condition when the user is assumed to be talking on the portable communication device and the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]); (b) receive the signal from the proximity sensor (See e.g. signal, Page 1,¶ [0012]); and (c) reduce power to the display if (See e.g. reduce power, display, Page 1 ¶ [0013]) (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims **2, 9**, Perez discloses (See e.g. the microprocessor the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]) reduces power to the display (See e.g. reduce power, display, Page 1 ¶ [0013]) only if (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims **4, 11**, Perez discloses the proximity sensor causes display to be turned off / the display (See e.g. 56 of Fig. 2).

Regarding claims **5, 12,** Perez discloses a mechanical proximity sensor, an optical sensor, and a range-detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claim **6,** Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claims **7, 13,** Perez discloses detecting whether an external object is proximate substantially concurrently (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]) with the mobile station receiving an incoming telephone call (See e.g. when the mobile station (MS) inherently receiving incoming phone call, or MS inherently placing an out going call by keying / dialing the number on the keypad and speaking into the microphone or listening to the earpiece, Page 2, ¶ [0015]).

Claim Rejections - 35 USC § 103

7. 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.

8. Claims 3, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Her (U.S. Patent 5,712,911).

With respect to claims 3, 10, Perez discloses everything as discussed above in the rejected claims 1, 8, 14. However, Perez dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered. In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Conclusion

9. 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 communication from the examiner should be directed to Kamran Afshar whose telephone number is **(571) 272-7796**. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

/KAMRAN AFSHAR/

Primary Examiner, Art Unit 2617

CUSTOMER NO. 46900 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. Goris 11-11

In re application of: Norman Goris et al.

Serial No.:	11/945,505	Group Art Unit:	2617
Filed:	11/27/07	Examiner:	Kamran Afshar
Matter No.:	992.1428	Phone No.:	571-272-7796

For: System and Method for Conserving Battery Power in a Mobile Station

AMENDMENT UNDER 37 CFR 1.116

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

Dear Sir:

This Amendment is filed in response to the final office action of 9/2/10. A Terminal Disclaimer accompanies this Amendment.

CLAIMS

1. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate ~~proximity of an external object~~; and

a microprocessor adapted to:

(a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that ~~whether~~ a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if both the first and second conditions exist ~~(i) the microprocessor determines that a telephone call is active, and (ii) the signal indicates the proximity of the external object~~.

2. (Original) The mobile station of claim 1, wherein the microprocessor reduces power to the display only if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object.

3. (Original) The mobile station of claim 1, wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

4. (Original) The mobile station as recited in claim 1, wherein the microprocessor reduces power to the display by turning off the display.

5. (Original) The mobile station as recited in claim 1, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

6. (Original) The mobile station as recited in claim 1, wherein the proximity sensor is located proximate to the display.

7. (Original) The mobile station as recited in claim 1, wherein the proximity sensor begins

detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call.

8. (Currently Amended) A method of conserving battery power in a mobile station, comprising:

the mobile station detecting the existence of a first condition, the first condition being that ~~whether~~ an external object is proximate;

the mobile station detecting the existence of a second condition independent and different from the first condition, the second condition being that ~~determining, independently of the determination whether the external object is proximate, whether~~ a telephone call is active; and

the mobile station reducing power consumption of a display of the mobile station if both the first and second conditions exist ~~(i) a telephone call is determined to be active, and (ii) the proximity of the external object is detected~~.

9. (Original) The method of claim 8, wherein the power consumption of the display is reduced only if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected.

10. (Currently Amended) The method of claim 8, further comprising:

if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then the mobile station automatically answering the incoming telephone call.

11. (Original) The method as recited in claim 8, wherein reducing power consumption of the display comprises turning off the display.

12. (Original) The method as recited in claim 8, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

13. (Original) The method as recited in claim 8, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing telephone call.

14. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate ~~proximity of an external object~~; and

a microprocessor adapted to:

(a) determine, independently of the determination whether the external object is proximate, the existence of a second condition different from the first condition, the second condition being that ~~whether~~ a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if both the first and second conditions exist ~~(i) the microprocessor determines that a telephone call is active, and (ii) the signal indicates the proximity of the external object~~.

REMARKS/ARGUMENTS

Claims 1-14 are pending in the application. Claims 1, 8, 10, and 14 are amended herein. The Applicant hereby requests examination of the application in view of the foregoing amendments and these remarks.

Double-Patenting Rejections

In paragraph 3 of the office action, the Examiner rejected claims 1-13 on the ground of nonstatutory obviousness-type double patenting as unpatentable over claims 1-20 of U.S. Patent No. 7,113,811. In paragraph 4 of the office action, the Examiner rejected claims 1-13 on the ground of nonstatutory obviousness-type double patenting as unpatentable over claims 1-13 of U.S. Patent No. 7,319,889. In response, the Applicant submits herewith a Terminal Disclaimer, which the Applicant believes should overcome these double-patenting rejections.

Art Rejections

In paragraph 6 of the office action, the Examiner rejected claims 1, 2, 4-9, and 11-14 under 35 U.S.C. §102(e) as anticipated by U.S. Patent Application Pub. No. 2004/0225904 ("Perez"). In paragraph 8, the Examiner rejected claims 3 and 10 under 35 U.S.C. §103(a) as obvious over Perez in view of U.S. Patent No. 5,712,911 ("Her").

For the following reasons, the Applicant submits that all of the now-pending claims are allowable over the cited references.

Claim 1, as amended herein, recites:

1. A mobile station, comprising:
a display;
a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and
a microprocessor adapted to:
(a) determine, without using the proximity sensor, the existence of **a second condition independent and different from the first condition**, the second condition being that a telephone call is active;
(b) receive the signal from the proximity sensor; and
(c) reduce power to the display **if both the first and second conditions exist**.

Support for the amendments to claims 1 and 8 and for new claim 14 is found in the specification, e.g., at p. 3, line 17, through p. 4, line 12.

The Examiner argued on pages 2 and 3 of the action that Perez discloses detecting a talk condition. Perez provides a number of examples of how a "talk condition" can be detected:

- A talk condition, for example, can be sensed by detecting if a predetermined volume of acoustic sound is being received at the microphone 20 or at another sensor such as a proximity sensor 26 indicative of a user talking on the portable communication device (paragraph [0015]);

- Alternatively, a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24 (paragraph [0015]);

- A talk condition can also be sensed by detecting an angle at which the portable communication device 10 is positioned or by detecting a vibration of the portable communication device 10 (paragraph [0015]);

- Another way for sensing a talk condition can be achieved by sensing if the portable communication device 10 is in a user's hand (paragraph [0015]); and

- In yet another alternative, sensing a talk condition can involve simply measuring a predetermined period after a phone call starts (paragraph [0016]).

In paragraph [0018], Perez states that "[p]ower for the light sources can be reduced or turned off either immediately upon detection of a talk condition or within a predetermined time as may be programmed into the portable communication device 10." Thus, in Perez, although several different ways of detecting a "talk condition" are disclosed, the detection of only **a single condition, namely, a "talk condition,"** is used to reduce display power.

Step (c) of amended claim 1 recites that power is reduced to the display "**if both the first and second conditions exist**," where the first condition is "**that an external object is proximate**," and the second condition is "**that a telephone call is active**." Claim 1 further recites that **the second condition is "independent and different from the first condition**." Thus, claim 1 requires that **two independent and distinct conditions be met**: (i) a telephone call is active, **and** (ii) an external object is proximate.

Since Perez fails to disclose display-power reduction based on these two independent and distinct conditions, but rather, uses only a single condition to reduce display power, Perez cannot possibly anticipate claim 1. For similar reasons, amended claims 8 and 14 are also patentable over Perez. Since the remaining claims depend variously from claims 1 and 8, it is further submitted that those claims are also allowable over Perez.

Conclusion

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Fees

During the pendency of this application, the Commissioner for Patents is hereby authorized to charge payment of any filing fees for presentation of extra claims under 37 CFR 1.16 and any patent application processing fees under 37 CFR 1.17 or credit any overpayment to Mendelsohn, Drucker, & Associates, P.C. Deposit Account No. 50-0782.

The Commissioner for Patents is hereby authorized to treat any concurrent or future reply, requiring a petition for extension of time under 37 CFR § 1.136 for its timely submission, as incorporating a petition for extension of time for the appropriate length of time if not submitted with the reply.

Respectfully submitted,

Date: November 1, 2010

/Kevin M. Drucker/

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UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	Goris 11-11	7512

46900 7590 11/12/2010
MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	**PAPER NUMBER**
2617	

MAIL DATE	DELIVERY MODE
11/12/2010	PAPER

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

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

PTOL-90A (Rev. 04/07)

Advisory Action Before the Filing of an Appeal Brief	Application No.	Applicant(s)	
	11/945,505	GORIS ET AL.	
	Examiner	Art Unit	
	KAMRAN AFSHAR	2617	

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

THE REPLY FILED 11/01/2010 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires *3* months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on ______. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): ______.
6. ☐ Newly proposed or amended claim(s) ______ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: ______.
   Claim(s) objected to: ______.
   Claim(s) rejected: *1-14*.
   Claim(s) withdrawn from consideration: ______.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: ______.
12. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). ______
13. ☐ Other: ______.

/KAMRAN AFSHAR/
Primary Examiner, Art Unit 2617

Continuation of 3. NOTE: does NOT place the application in condition for allowance because: They raise new issue that would require further consideration and / or search since the scop of the claimed invention has changed i.e. 1. (Currently Amended) A mobile station, comprising: a display; a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and a microprocessor adapted to: (a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that a telephone call is active; (b) receive the signal from the proximity sensor; and (c) reduce power to the display if both the first and second conditions exist .

CUSTOMER NO. 46900 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. Goris 11-11

In re application of: Norman Goris et al.

Serial No.:	11/945,505	Group Art Unit:	2617
Filed:	11/27/07	Examiner:	Kamran Afshar
Matter No.:	992.1428	Phone No.:	571-272-7796

For: System and Method for Conserving Battery Power in a Mobile Station

DO NOT ENTER: /K.A./

AMENDMENT UNDER 37 CFR 1.116

/K.A./ 11/03/2010

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

Dear Sir:

This Amendment is filed in response to the final office action of 9/2/10. A Terminal Disclaimer accompanies this Amendment.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	11/945,505	Filing Date	2007-11-27	Docket Number (if applicable)	Goris 11-11	Art Unit	2617
First Named Inventor	Norman Goris			Examiner Name	Kamran Afshar		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on ____________
- ☐ Other ____________

☐ Enclosed

- ☐ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other ____________

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months ____________
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other ____________

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to
Deposit Account No 500782

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature
☐ Applicant Signature

EXHIBIT D, APPX105

Signature of Registered U.S. Patent Practitioner			
Signature	/Kevin M. Drucker/	Date (YYYY-MM-DD)	2010-11-16
Name	Kevin M. Drucker	Registration Number	47537

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NOTICE OF ALLOWANCE AND FEE(S) DUE

46900 7590 12/29/2010

MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 12/29/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11	7512

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	03/29/2011

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

46900 7590 12/29/2010

MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

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

Certificate of Mailing or Transmission

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

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11	7512

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	03/29/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
AFSHAR, KAMRAN	2617	455-574000

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

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

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

2. For printing on the patent front page, list

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

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

1 __________
2 __________
3 __________

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

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

(A) NAME OF ASSIGNEE

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

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

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

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

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

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

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

☐ 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).

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. ____________________

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11	7512

46900 7590 12/29/2010

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EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 12/29/2010

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 451 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 451 day(s).

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

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

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

Notice of Allowability	Application No. 11/945,505	Applicant(s) GORIS ET AL.	
	Examiner KAMRAN AFSHAR	Art Unit 2617	

-- 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 *11/16/2010*.

2. ☒ The allowed claim(s) is/are *1-14*.

3. ☐ 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.

4. ☐ 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.

5. ☐ 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).

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

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date ______
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date ______ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other ______.

/KAMRAN AFSHAR/
Primary Examiner, Art Unit 2617

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/16/2010 has been entered.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

In The Claims:

1. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of ~~the~~ <u>an</u> existence of a first condition, the first condition being that an external object is proximate; and

a microprocessor adapted to:

(a) determine, without using the proximity sensor, ~~the~~ <u>an</u> existence of a second condition independent and different from the first condition, the second condition being that whether a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if both the first and second conditions exist.

8. (Currently Amended) A method of conserving battery power in a mobile station,

comprising:

the mobile station detecting ~~the~~ <u>an</u> existence of a first condition, the first condition being that whether an external object is proximate;

the mobile station detecting ~~the~~ <u>an</u> existence of a second condition independent and different from the first condition, the second condition being that determining, a telephone call is active; and

the mobile station reducing power consumption of a display of the mobile station if both the first and second conditions exist.

14. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of ~~the~~ <u>an</u> existence of a first condition, the first condition being that an external object is proximate; and

a microprocessor adapted to:

(a) determine, independently of the determination whether the external object is proximate, ~~the~~ an existence of a second condition different from the first condition, the second condition being that a telephone call is active;

(b) receive the signal from the proximity sensor; and

(c) reduce power to the display if both the first and second conditions exist.

Allowable Subject Matter

3. In view the Amended claims further search and the Terminal Disclaimer, Claims 1-14 are allowed.

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

Claims 1-14 are allowed for the reasons as set forth in applicant's response filed on 11/01/2010.

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

Conclusion

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-7495. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

/KAMRAN AFSHAR/

Primary Examiner, Art Unit 2617

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

46900 7590 03/23/2011
MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 03/23/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11	7512

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	06/23/2011

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

PART B - FEE(S) TRANSMITTAL

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

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

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

46900 7590 03/23/2011
MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

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

Certificate of Mailing or Transmission

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

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11	7512

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	06/23/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
AFSHAR, KAMRAN	2617	455-574000

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

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

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

2. For printing on the patent front page, list

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

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

1 __________

2 __________

3 __________

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

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

(A) NAME OF ASSIGNEE

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

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

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

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies __________

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

❑ A check is enclosed.

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

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number ________ (enclose an extra copy of this form).

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

❑ 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).

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. __________

EXHIBIT D, APPX116

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11	7512

46900 7590 03/23/2011
MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 03/23/2011

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 451 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 451 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).

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Notice of Allowability	Application No. 11/945,505	Applicant(s) GORIS ET AL.	
	Examiner KAMRAN AFSHAR	Art Unit 2617	

-- 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 *03/18/2011*.

2. ☒ The allowed claim(s) is/are *1-14*.

3. ☐ 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.

4. ☐ 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.

5. ☐ 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).

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

Attachment(s)
1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 03/18/2011
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date ______ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other ______.

/KAMRAN AFSHAR/
Primary Examiner, Art Unit 2617

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/16/2010 has been entered.

Allowable Subject Matter

2. In view the Amended claims further search and the Terminal Disclaimer, Claims 1-14 are allowed.

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

Claims 1-14 are allowed for the reasons as set forth in the previous action mailed 12/29/2010.

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

Conclusion

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, Eng, George can be reached @ (571) 272-7495. The fax number for the organization where this application or proceeding is assigned is 571-273-8300 for all communications.

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).

/KAMRAN AFSHAR/

Primary Examiner, Art Unit 2617

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/463,630	06/17/2003	Norman Goris	N. GORIS 4-4	1595

47396 7590 07/27/2006

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

EXAMINER	
AFSHAR, KAMRAN	

ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 07/27/2006

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

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
10/463,630	6/17/03	Norman Gorin	N. Gorin 4-4

EXAMINER	
Kamran Afshar	
ART UNIT	PAPER
2617	20060724

DATE MAILED:

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

Commissioner for Patents

The amendment filed on 07/20/2006 under 37 CFR 1.312 has been considered and has been entered as directed to matters of form not affecting the scop of the invention

Kamran Afshar, 571-272-7796
Patent Examiner
Art Unit: 2617

Response to Rule 312 Communication	**Application No.** 10/463,630	**Applicant(s)** GORIS ET AL.	
	Examiner Kamran Afshar, 571-272-7796	**Art Unit** 2617	

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

1. ☒ The amendment filed on *07/20/2006* under 37 CFR 1.312 has been considered, and has been:

a) ☐ entered.

b) ☒ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

JOSEPH FEILD
SUPERVISORY PATENT EXAMINER

Kamran Afshar, 571-272-7796
Patent Examiner
Art Unit: 2617

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

47396 7590 04/21/2006

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

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 04/21/2006

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/463,630	06/17/2003	Norman Goris	N. GORIS 4-4	1595

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$1700	07/21/2006

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. 01/06) 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**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax **(571)-273-2885**

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

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

47396 7590 04/21/2006

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

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

Certificate of Mailing or Transmission

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

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/463,630	06/17/2003	Norman Goris	N. GORIS 4-4	1595

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$1700	07/21/2006

EXAMINER	ART UNIT	CLASS-SUBCLASS
AFSHAR, KAMRAN	2617	455-574000

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

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

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

2. For printing on the patent front page, list

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

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

1 ____________

2 ____________

3 ____________

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

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

(A) NAME OF ASSIGNEE

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

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

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

☐ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies ____________

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 ____________ Date ____________

Typed or printed name ____________ Registration No. ____________

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

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/463,630	06/17/2003	Norman Goris	N. GORIS 4-4	1595

47396 7590 04/21/2006

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

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 04/21/2006

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 175 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 175 day(s).

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

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

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

Notice of Allowability	Application No. 10/463,630	Applicant(s) GORIS ET AL.
	Examiner Kamran Afshar, 571-272-7796	Art Unit 2617

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

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

1. ☒ This communication is responsive to 4/3/2006.
2. ☒ The allowed claim(s) is/are 1-20.
3. ☐ 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.

4. ☐ 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.
5. ☐ 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).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

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

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Joel Justiss, Reg. No.: 48,981 on 4/3/2006.

The application has been amended as follows:

In The Claim(s):

1. (Amended) A mobile station, comprising:

a chassis having a display;

a power reducer configured to control power consumption of said display; ~~and~~

a proximity sensor coupled to said chassis and ~~automatically activated when said mobile station receives an incoming wireless telephone call based on a telephone call associated with said mobile station,~~ ~~said proximity sensor~~ configured to cause said power consumption to be reduced when said display is within a predetermined range of an external object, and

a microprocessor directly coupled to said proximity sensor through a keypad of said mobile station and directly coupled to said display, said microprocessor configured to automatically activate said proximity sensor based on said mobile station receiving an incoming wireless telephone call.

8. (Amended) A method of conserving battery power in a mobile station, comprising:

employing a microprocessor of said mobile station to automatically activating a proximity sensor when said mobile station receives an incoming wireless telephone call, said microprocessor directly coupled to said proximity sensor through a keypad of said mobile station and directly coupled to said display ~~based on a telephone call associated with said mobile station~~;

sensing with said proximity sensor when a display of said mobile station is within a predetermined distance of an external object; and

causing, in response thereto, a power consumption of said display to be reduced.

15. (Amended) A mobile station, comprising:

a chassis having a display;

a power reducer configured to control power consumption of said display; ~~and~~

a proximity sensor coupled to said chassis and ~~automatically activated when based on said mobile station wirelessly receives receiving an incoming telephone call, said proximity sensor~~ configured to cause said display to be turned off when said display is within a predetermined range of an external object during an incoming wireless ~~said~~ telephone call, and

a microprocessor directly coupled to said proximity sensor through a keypad of said mobile station and directly coupled to said display, said microprocessor configured to automatically activate said proximity sensor based on said mobile station receiving said incoming wireless telephone call.

Allowable Subject Matter

2. In view of the Amended claim(s) in item 1, Claims1-20 are allowed.

The following is an examiner's statement of reasons for allowance: 1-20.

With respect to claim 1, the prior art of record fails to disclose singly or in combination or render obvious that the proximity sensor coupled to the chassis and configured to cause the power consumption to be reduced when the display is within a predetermined range of an external object, and a microprocessor directly coupled to the proximity sensor through a keypad of the mobile station and directly coupled to the display, the microprocessor configured to automatically activate the proximity sensor based on the mobile station receiving an incoming wireless telephone call.

With respect to claim 8, the prior art of record fails to disclose singly or in combination or render obvious that the method employing a microprocessor of the mobile station to automatically activating a proximity sensor when the mobile station receives an incoming wireless telephone call, the microprocessor directly coupled to the proximity sensor through a keypad of the mobile station and directly coupled to the display; sensing with the proximity sensor when a display of the mobile station is within a predetermined distance of an external object; and causing, in response thereto, a power consumption of the display to be reduced.

With respect to claim 15, the prior art of record fails to disclose singly or in combination or render obvious that the proximity sensor coupled to the chassis and configured to cause the display to be turned off when the display is within a predetermined range of an external object during an incoming wireless telephone call, and a microprocessor directly coupled to the proximity sensor through a keypad of said mobile station and directly coupled to the display, the microprocessor configured to automatically activate the proximity sensor based on the mobile station receiving the incoming wireless telephone call.

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

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Park (U.S. Pub. No.: 2002/0177475 A1).

b) Chong (U.S. Pub. No.: 2003/0036412 A1).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Feild, Joseph** can be reached @ (571) 272-4090. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

Kamran Afshar

JOSEPH FEILD
SUPERVISORY PATENT EXAMINER

Interview Summary	Application No. 10/463,630	Applicant(s) GORIS ET AL.	
	Examiner Kamran Afshar, 571-272-7796	Art Unit 2617	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Kamran Afshar, 571-272-7796*. (3)______.

(2) *Mr. Joel Justiss, Reg. No.: 48,981*. (4)______.

Date of Interview: *03 April 2006*.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☐ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☐ No.
If Yes, brief description: ______.

Claim(s) discussed: *Merits of the claim(s)*.

Identification of prior art discussed: ______.

Agreement with respect to the claims f)☒ was reached. g)☐ was not reached. h)☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *Discussed merits of the claim(s) and Applicant authorized the Examiner's Amendment which is fully addressed in the office action* .

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/463,630	06/17/2003	Norman Goris	N. GORIS 4-4	1595

47396 7590 11/17/2005

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

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	**PAPER NUMBER**
2681	

DATE MAILED: 11/17/2005

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)	
	10/463,630	GORIS ET AL.	
	Examiner	Art Unit	
	Kamran Afshar, 571-272-7796	2681	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *12 September 2005*.

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) *1-20* 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) *1-20* 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 *17 June 2003* 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) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment / Response to Arguments

1. The Affidavits filed on 09/12/2005 under 37 CFR 1.131 has been considered but is ineffective to overcome the Perez (U.S. Pub. No.: 2004/0225904 A1) reference.

2. The evidence submitted is insufficient to establish a conception of the invention prior to the effective date of the Perez (U.S. Pub. No.: 2004/0225904 A1) reference. While conception is the mental part of the inventive act, it must be capable of proof, such as by demonstrative evidence or by a complete disclosure to another. Conception is more than a vague idea of how to solve a problem. The requisite means themselves and their interaction must also be comprehended. See *Mergenthaler v. Scudder*, 1897 C.D. 724, 81 O.G. 1417 (D.C. Cir. 1897). Applicant failing to show possession of the entire claimed invention:

In claim 1, Applicant failing to show a mobile station, comprising: a chassis having a display; a power reduce configured to control power consumption of said display; and a proximity sensor coupled to said chassis and activated based on a telephone call associated with said mobile station, said proximity sensor configured to cause said a power consumption to be reduced when said display is within a predetermined range of an external object.

In claims 2, 9, Applicant failing to show wherein said proximity sensor caused said display to be turned off.

In claims 3, 10, Applicant failing to show wherein said proximity sensor causes said power consumption to be reduced when said display is within said predetermined range during telephone call.

In claims 4, 11, 16, Applicant failing to show the proximity sensor selected from group consisting of: a mechanical proximity sensor, an optical sensor, and a range detecting sensor.

In claims 5, 17, Applicant failing to show the proximity sensor is located proximate the display.

In claim 6, Applicant failing to show the proximity sensor is activated automatically when said telephone call is a wireless incoming call and is activated manually when said telephone call is a wireless outgoing call.

In claims 7, 14, 19, Applicant failing to show wherein said predetermined range is about five centimeters and said external object is selected from the group consisting of: the ear of a user, and a pocket.

In claim 8, Applicant failing to show a method of conserving battery power in a mobile station comprising: activating a proximity sensor based on a telephone call associated with aid mobile station; sensing with said proximity sensor when a display of said mobile station is within a predetermined distance of an external object; and causing, in response thereto, a power consumption of said display to be reduced.

In claim 12, Applicant failing the proximity sensor is activated based on user interaction with a keypad of said mobile station when said telephone call is an outgoing call.

In claim 13, Applicant failing the proximity sensor is activated automatically when the mobile station wirelessly receives said telephone call.

In claim 15, Applicant failing to show a mobile station, comprising: a chassis having a display; a power reducer configured to control power consumption of said display; and a proximity sensor coupled to said chassis and activated based on said mobile station wirelessly receiving an incoming telephone call, said proximity sensor configured to cause said display to be turned off when said display is within a predetermined range of an external object said during telephone call.

In claim 18, Applicant failing to show the proximity sensor is located on a speaker side of chassis.

In claim 20, Applicant failing to show the proximity sensor is activated automatically.

3. The evidence submitted is insufficient to establish diligence from a date prior to the date of reduction to practice of the Perez (U.S. Pub. No.: 2004/0225904 A1) reference to either a constructive reduction to practice or an actual reduction to practice. Where conception occurs prior to the date of the reference, but reduction to practice is afterward, it is not enough merely to allege that applicant or patent owner had been diligent. Ex parte Hunter, 1889 C.D. 218, 49 O.G. 733 (Comm'r Pat. 1889). Rather, applicant must show evidence of facts establishing diligence.

THE ENTIRE PERIOD DURING WHICH DILI-GENCE IS REQUIRED MUST BE ACCOUNTED FOR BY EITHER AFFIRMATIVE ACTS OR ACCEPTABLE EXCUSES

An applicant must account for the entire period during which diligence is required. Gould v. Schawlow, 363 F.2d 908, 919, 150 USPQ 634, 643 (CCPA 1966) (Merely stating that there were no weeks or months that the invention was not worked on is not enough.); In re Harry, 333 F.2d 920, 923, 142 USPQ 164, 166 (CCPA 1964) (statement that the subject matter "was diligently reduced to practice" is not a showing but a mere pleading). A 2-day period lacking activity has been held to be fatal. In re Mulder, 716 F.2d 1542, 1545, 219 USPQ 189, 193 (Fed. Cir. 1983) (37 CFR 1.131 issue); Fitzgerald v. Arbib, 268 F.2d 763, 766, 122 USPQ 530, 532 (CCPA 1959) (Less than 1 month of inactivity during critical period. Efforts to exploit an invention commercially do not constitute diligence in reducing it to practice. An actual reduction to practice in the case of a design for a three-dimensional article requires that it should be embodied in some structure other than a mere drawing.); Kendall v. Searles, 173 F.2d 986, 993, 81 USPQ 363, 369 (CCPA 1949) (Diligence requires that applicants must be specific as to dates and facts.). **See MEPP 2138.06.**

In Addition, applicant failing to show evidence of conception prior to the effective date of the Perez (U.S. Pub. No.: 2004/0225904 A1) reference for all the claims limitations, Applicant also has failed to establish diligence, See MPEP 2183.06. Whereby Applicant must show diligence for the entire period. A 2-day period lacking activity has been held to be fatal. Therefore, Examiner holds the previous claimed rejection, which is fully addressed below.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-7 and 15-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Regarding claims 1 and 15, the original specification fails to support the newly add limitation " a power reducer configured to control power consumption of said display", as recited in the claims.

Claim Rejections - 35 USC § 102

6. 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 1-6, 8-11 and 15-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

With respect to claims 1, 8, 15, Perez discloses a method / a mobile station (See i.e. radio communication apparatus, Title, Abstract), comprising: a chassis (i.e. enclosure, housing, main body, etc.) having a display; power reducer configured to control power consumption of the display (See e.g. processor 16 of Fig. 1 is programmed to at least reduce power provided to the display the sensor detects the talk condition, Co Page 1, paragraph [0013]) and a proximity sensor (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1) coupled inherently to the chassis and activated based on the mobile station inherently wirelessly receiving a incoming telephone call (See e.g. Page 2, Paragraph [0014]) and / or a telephone call associated with mobile station (See talk condition involved a phone call starting, Page 2, Paragraph [0016]), the talk condition should generally be understood as the condition when a user is on an active call (that is when inherently the mobile station receiving incoming phone call) and speaking into the microphone or listening to the earpiece. A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (See e.g. Page 3, for the by pressing or depressing keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display). Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]), the proximity sensor adapted to cause a power consumption of (i.e. conserving power) display (See e.g. 10, 12, 24, 26, 28, 30 of Fig. 1) to be reduced and / or turned off (See e.g. 56 of Fig. 2) when display is within a predetermined range (i.e. predetermined angle-range, position, volume, spectrum energy or density) of an external object (See e.g. user's head , user's ear, user's face, user's hand, user's pocket, or bag, etc. Page 2, Paragraph [0015]) and / or during a telephone call (See e.g. Page 1, Paragraph [0009], Page 3, Paragraph [0020]).

Regarding claims 2, 9, Perez discloses the proximity sensor causes display to be turned off (See e.g. 56 of Fig. 2).

Regarding claims 3,10, Perez discloses the proximity sensor causes power consumption to be reduced when display is within predetermined range during the telephone call (See e.g. talk condition, 56 of Fig. 2, Page 3, Paragraph [0020]).

Regarding claims 4, 11, 16, Perez discloses a mechanical proximity sensor, an optical sensor, and a range detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claims 5, 17, Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claim 6, Perez discloses the proximity sensor is activated automatically (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) when telephone call is inherently a wireless incoming call (that is when the mobile station starts an active call inherently receiving an incoming call which is one of many ways of the talk condition, See Page 2, Paragraph [0016]) and is activated manually when telephone call is a wireless outgoing call (that is when by depressing a key manually activating and out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020]).

Regarding claim 18, Perez discloses the proximity sensor is located on a speaker side of chassis (See e.g. 10, 24, 26, 28, 30 of Fig. 1).

Regarding claim 13, Perez discloses the proximity sensor is activated automatically when the mobile station receives the telephone call (See e.g. Page 2 Paragraph [0014]), the talk condition should generally be understood as the condition when a user is on an active call (that is when the mobile station receiving incoming phone call) and speaking into the microphone or listening to the earpiece. A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (for the keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display). Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]).

Claim Rejections - 35 USC § 103

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

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

9. Claims 7, 12-14 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Sawada (U.S. Pub. No.: 2002/084998 A1).

With respect to claims 7, 14, 19, Perez discloses everything as discussed above in the rejected claims 1, 8, 15. In an analogous, Perez further discloses the proximity sensor is measuring the distance and / or the range of proximity of the user ear (i.e. user's head to earpiece, See Co. 2, Paragraph [0015]) the mobile station. Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to set the range about five centimeters to the external object (i.e. the user ear, a pocket, and or a bag) so that the proximity sensor measuring the range (i.e. distance, threshold, etc.) is aware of the area surrounding the mobile station (See e.g. Page 1, Paragraph [0009]), and the predetermine range (i.e. threshold) is set in as a few centimeters (See e.g. Page 3, Paragraph [0037]).

Regarding claim 12, it is obvious that the proximity sensor is activated based on user interaction with a keypad (i.e. key-activity, talk condition, pressing / depressing the key or button, etc.) of the mobile station when the telephone call is outgoing call (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

Regarding, claims 13, 20, it is obvious that the proximity sensor is activated automatically when the mobile station inherently wirelessly receives the telephone call (See Perez e.g. sensor or sensors 100, and automatic adjusting poser consumption and / or the sensor is activated automatically, Page, 2, Paragraph [0019]).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Geil (U.S. 5,881,377 A1), which Communication device and display blanking control method therefor.

b) Son (U.S. 6,278,887 B1), which discloses System and method for power conservation in a wireless communication handset.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Feild, Joseph** can be reached @ (571) 272-4090. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

JOSEPH FEILD
SUPERVISORY PATENT EXAMINER

Kamran Afshar

Office Action Summary	Application No.	Applicant(s)	
	10/463,630	GORIS ET AL.	
	Examiner	Art Unit	
	Kamran Afshar, 571-272-7796	2681	

-- *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 03 June 2005.

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) 1-20 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) 1-20 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) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. 6/29/2005
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 6/ 3/ 2005 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e. the proximity sensor is activated by receiving incoming telephone call and reducing the power consumption of the display). Examiner very kindly directs the Applicant to Page 2 Paragraph [0014], as Perez discloses the talk condition should generally be understood as the condition when a user is on an active call (that is when the mobile station receiving incoming phone call) and speaking into the microphone or listening to the earpiece. A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (for the keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display). Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]. Therefore, it is believed that Perez does disclose each and every element of independent claims 1, 8, 15. As such Perez is an anticipating reference to Claims 1, 8, 18 and Claims dependent thereon.

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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1-6, 8-13, 15-18, 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

With respect to claims 1, 8, 15, Perez discloses a method / a mobile station (See i.e. radio communication apparatus, Title, Abstract), comprising: a chassis (i.e. enclosure, housing, main body, etc.) having a display; and a proximity sensor (i.e. short range detector or sensor) coupled inherently to chassis and activated based on the mobile station receiving a telephone call (See e.g. Page 2 Paragraph [0014]), the talk condition should generally be understood as the condition when a user is on an active call (that is when the mobile station receiving incoming phone call) and speaking into the microphone or listening to the earpiece. A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (for the keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display). Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]), the proximity sensor adapted to cause a power consumption of (i.e. conserving power) display (See e.g. 10, 12, 24, 26, 28, 30 of Fig. 1) to be reduced and / or turned off (See e.g. 56 of Fig. 2) when display is within a predetermined range (i.e. predetermined angle-range, position, volume, spectrum energy or density) of an external object (See e.g. user's head , user's ear, user's face, user's hand, user's pocket, or bag, etc. Page 2, Paragraph [0015]) and / or during a telephone call (See e.g. Page 1, Paragraph [0009], Page 3, Paragraph [0020]).

Regarding claims 2, 9, Perez discloses the proximity sensor causes display to be turned off (See e.g. 56 of Fig. 2).

Regarding claims 3,10, Perez discloses the proximity sensor causes power consumption to be reduced when display is within predetermined range during the telephone call (See e.g. talk condition, 56 of Fig. 2, Page 3, Paragraph [0020]).

Regarding claims 4, 11, 16, Perez discloses a mechanical proximity sensor, an optical sensor, and a range detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claims 5, 12, 17 Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claims 6, 18, Perez discloses the proximity sensor is located on a speaker side of chassis See e.g. 10, 24, 26, 28, 30 of Fig. 1).

Regarding claims 13, 20, Perez discloses the proximity sensor is activated automatically when the mobile station receives the telephone call (See e.g. Page 2 Paragraph [0014]), the talk condition should generally be understood as the condition when a user is on an active call (that is when the mobile station receiving incoming phone call) and speaking into the microphone or listening to the earpiece. A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (for the keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display). Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]).

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 7, 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Sawada (U.S. Pub. No.: 2002/084998 A1).

With respect to claims 7, 14, 19, Perez discloses everything as discussed above in the rejected claims 1, 8, 15. In an analogous, Perez further discloses the proximity sensor is measuring the distance and / or the range of proximity of the user ear (i.e. user's head to earpiece, See Co. 2, Paragraph [0015]) the mobile station. Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to set the range about five centimeters to the external object (i.e. the user ear, a pocket, and or a bag) so that the proximity sensor measuring the range (i.e. distance, threshold, etc.) is aware of the area surrounding the mobile station (See e.g. Page 1, Paragraph [0009]), and the predetermine range (i.e. threshold) is set in as a few centimeters (See e.g. Page 3, Paragraph [0037]).

Conclusion

6. 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.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Kawamura (U.S. 2004/0198458 A1), which discloses Portable Information Terminal.

b) Giel (U.S. 5,881,377), which discloses Communication Device And Display Banking Control Method Therefore.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Feild, Joseph** can be reached @ (571) 272-4090. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

Kamran Afshar

JOSEPH FEILD
SUPERVISORY PATENT EXAMINER

Interview Summary	Application No.	Applicant(s)
	10/463,630	GORIS ET AL.
	Examiner	Art Unit
	Kamran Afshar, 571-272-7796	2681

All participants (applicant, applicant's representative, PTO personnel):

(1) *Kamran Afshar, 571-272-7796*. (3)_____.

(2) *J. Joel Justiss, Reg. No: 48, 981*. (4)_____.

Date of Interview: *6/29/2005*.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☐ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☐ No.
If Yes, brief description: _____.

Claim(s) discussed: *Discussed merits of the claims*.

Identification of prior art discussed: _____.

Agreement with respect to the claims f)☐ was reached. g)☐ was not reached. h)☒ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *Discussed merits of the claims and Applicant stated that will file swering behind Perez et al (US 20004/0225904 A1)*.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)
In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Notice of References Cited	Application/Control No. 10/463,630	Applicant(s)/Patent Under Reexamination GORIS ET AL.	
	Examiner Kamran Afshar, 571-272-7796	Art Unit 2681	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-5,712,911	01-1998	Her, Ju-Won	379/388.01
	B	US-5,881,377	03-1999	Giel et al.	455/574
	C	US-2004/0198458 A1	10-2004	Kawamura, Kenji	455/566
	D	US-			
	E	US-			
	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.

YW

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/463,630	06/17/2003	Norman Goris	N. GORIS 4-4	1595

47396 7590 02/23/2005

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

EXAMINER	
AFSHAR, KAMRAN	

ART UNIT	PAPER NUMBER
2681	

DATE MAILED: 02/23/2005

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

Office Action Summary	Application No. 10/463,630	Applicant(s) GORIS ET AL.
	Examiner Kamran Afshar, 703-305-7373	Art Unit 2681

-- 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 ______.

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) *1-20* 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) *1-20* 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 *06/17/2003* 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) ☐ 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1-6, 8-13, 15-18, 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

With respect to claims 1, 8, 15, Perez discloses a method / a mobile station (See i.e. radio communication apparatus, Title, Abstract), comprising: a chassis (i.e. enclosure, housing, main body, etc.) having a display; and a proximity sensor (i.e. short range detector or sensor) coupled inherently to chassis and adapted to cause a power consumption of (i.e. conserving power) display (See e.g. 10, 12, 24, 26, 28, 30 of Fig. 1) to be reduced and / or turned off (See e.g. 56 of Fig. 2) when display is within a predetermined range (i.e. predetermined angle-range, position, volume, spectrum energy or density) of an external object (See e.g. user's head , user's ear, user's face, user's hand, user's pocket, or bag, etc. Page 2, Paragraph [0015]) and / or during a telephone call (See e.g. Page 1, Paragraph [0009], Page 3, Paragraph [0020]).

Regarding claims 2, 9, Perez discloses the proximity sensor causes display to be turned off (See e.g. 56 of Fig. 2).

Regarding claims 3,10, Perez discloses the proximity sensor causes power consumption to be reduced when display is within predetermined range during a telephone call (See e.g. talk condition, 56 of Fig. 2, Page 3, Paragraph [0020])).

Regarding claims 4, 16, 11, Perez discloses a mechanical proximity sensor, an optical sensor, and a range detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claims 5, 12, 17 Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claims 6, 13, 18, Perez discloses the proximity sensor is located on a speaker side of chassis See e.g. 10, 24, 26, 28, 30 of Fig. 1).

Regarding claim 20, Perez discloses a keypad (See e.g. 18 of Fig. 1, Page 3, Paragraph [0020]).

3. Claims 1-3, 7-10, 14-15,17, 19-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Sawada (U.S. Pub. No.: 2002/084998 A1).

With respect to claims 1, 8, 15, Sawada discloses a method / a mobile station (See i.e. radio communication apparatus, Title, Abstract), inherently comprising: a chassis (i.e. enclosure, housing, main body, etc.) having a display; and a proximity sensor (i.e. short range detector or sensor, distance detector or sensor,) coupled inherently to chassis and adapted to cause a power consumption of (i.e. conserving power) display (See e.g. 37, 21a, 34 of Figs. 1, 7) to be reduced and / or turned off (See e.g. Page 3, Paragraphs [0034]-[0035]) when display is within a predetermined range (See e.g. predetermined threshold set within / as a few centimeter, Page 3, Paragraphs [0037]-[0038]) of an external object (See e.g. user's head , user's ear, user's face, user's hand, user's pocket, or bag, etc. Page 2, Paragraph [0020]) and / or during a telephone call (See e.g. operational state, Page 2, Paragraph [0028], Page 3, Paragraphs [0033]-[0034]).

Regarding claims 2, 9, Sawada discloses the proximity sensor causes display (See e.g. 37, 21a, 34 of Figs. 1, 7) to be turned off (See e.g. Page 3, Paragraphs [0033]-[0034] & Figs. 2-3).

Regarding claims 3, 10, Sawada discloses the proximity sensor causes power consumption to be reduced when display (See e.g. 37, 21a, 34 of Figs. 1, 7) is within predetermined range during a telephone call ((See e.g. operational state, communication, talking, conversation state, etc., and Page 2, Paragraph [0028], Page 3, Paragraphs [0033]-[0034]).

Regarding claims 7, 14, 19, Sawada discloses predetermined range is about five centimeters (See e.g. predetermined threshold set within / as a few centimeter, Page 3, Paragraphs [0037]-[0038]) and external object is selected from the group consisting of: the ear of a user, and a pocket (See e.g. user's head , user's ear, user's face, user's hand, user's pocket, or bag, etc. Page 2, Paragraph [0020]).

Regarding claim 20, Sawada discloses a keypad (See e.g. 35 of Fig. 1, 7).

Conclusion

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (703) 305-7373. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, Emmanuel Moise can be reached @ (703) 306-0003. The fax number for the organization where this application or proceeding is assigned is (703) 872-9306 for all communications.

Kamran Afshar

E. Moise
EMMANUEL L. MOISE
PRIMARY EXAMINER

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

46900 7590 10/11/2007

MENDELSOHN & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 10/11/2007

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/516,316	09/06/2006	Norman Goris	GORIS 10-10	9565

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$300	$0	$1740	01/11/2008

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

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

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

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

46900 7590 10/11/2007

MENDELSOHN & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

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

Certificate of Mailing or Transmission

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

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/516,316	09/06/2006	Norman Goris	GORIS 10-10	9565

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$300	$0	$1740	01/11/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
AFSHAR, KAMRAN	2617	455-574000

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, 1 ____

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

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

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

(A) NAME OF ASSIGNEE

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

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

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

☐ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies ____

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

☐ A check is enclosed.

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

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number ____ (enclose an extra copy of this form).

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

☐ 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).

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

Authorized Signature ____ Date ____

Typed or printed name ____ Registration No. ____

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

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/516,316	09/06/2006	Norman Goris	GORIS 10-10	9565

46900 7590 10/11/2007

MENDELSOHN & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 10/11/2007

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 0 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 0 day(s).

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

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

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

Notice of Allowability	Application No. 11/516,316	Applicant(s) GORIS ET AL.	
	Examiner Kamran Afshar, 571-272-7796	Art Unit 2617	

-- 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 09/19/2007.

2. ☒ The allowed claim(s) is/are 21-26, 28-32, 35 and 37.

3. ☐ 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.

4. ☐ 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.

5. ☐ 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).

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

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

GEORGE ENG
SUPERVISORY PATENT EXAMINER

DETAILED ACTION

Allowable Subject Matter

1. In view of the Terminal Disclaimer and the Amended claim(s), Claims 21-26, 28-32, 35 and 37 are allowed.

The following is an examiner's statement of reasons for allowance: 21-26, 28-32, 35 and 37.

Claims 21-26, 28-32, 35 and 37 are allowed for the reasons as set forth in the previous action mailed 07/19/2007.

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

Conclusion

2. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Bahl (U.S. Pub. No.: 2003/0197597 A1).

b) Lunsford (U.S. 6,665,803 B2).

c) Lin (U.S. Pub. No.: 2006/0284848 A1).

d) Bahl (U.S. Pub. No.: 2006/0019724 A1).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

Kamran Afshar

GEORGE ENG
SUPERVISORY PATENT EXAMINER

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/516,316	09/06/2006	Norman Goris	Goris 10-10	9565

46900 7590 07/19/2007
MENDELSOHN & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	

ART UNIT	PAPER NUMBER
2617	

MAIL DATE	DELIVERY MODE
07/19/2007	PAPER

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

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

Office Action Summary	Application No. 11/516,316	Applicant(s) GORIS ET AL.
	Examiner Kamran Afshar, 571-272-7796	Art Unit 2617

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on 30 April 2007.

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) 21-39 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) 21-39 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 30 April 2007 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/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 04/30/2007 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e. power reduction based on two separate and distinct condition i.e. if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object, See e.g. Page 9, ¶ [0018]). Examiner very kindly directs the Applicant to Page 2 Paragraph [0014], as Perez discloses the talk condition should generally be understood as the condition when a user is on an active call (See e.g. Page 2, ¶ [0014], that is when the mobile station (MS) inherently receiving incoming phone call, or MS inherently placing an out going call by keying / dialing the number on the keypad and speaking into the microphone or listening to the earpiece, Page 2, ¶ [0015]). The determination is being done by the processor (See Page 1, ¶ [0013]). And the signal indicates the proximity of the external object (See e.g. signal, Page 1,¶ [0012], a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24 as further detailed with respect to FIG. 3, Page 2, ¶ [0015]). Further more, A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (for the keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display). Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]. Therefore, it is believed that Perez does disclose each and every element of independent claims 21 and 28. As such Perez is an anticipating reference to Claims 21, 28 and Claims dependent thereon.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, in an analogous field of endeavor, Her discloses a vigorously well known concept of a system and or method that a proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54). Therefore it is analogous, and the previous rejection is maintained.

Regarding obviousness Double-Patenting rejection, Applicant argues that, if necessary, a terminal disclaimer will be filed. In Response, the Double patenting rejection will be withdrawn upon a proper Terminal Disclaimer is filed. Therefore, the previous Double-patenting rejection is maintained.

Claim Objections

2. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claim 35 depending from claim 28 has been renumbered to claim 36.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226

(Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 21-39 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 7,113,811 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same subject matter which includes: 1) A mobile station, 2) a display, 3) reduce power to the display, 4) the microprocessor determines that a telephone call, 4) external object.

"A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or **anticipated by**, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651 (affirming a holding of obviousness-type double patenting because the claims at issue were obvious over claims in four prior art patents); In re Berg, 140 F.3d at 1437, 46 USPQ2d at 1233 (Fed. Cir. 1998) (affirming a holding of obviousness-type double patenting where a patent application claim to a genus is anticipated by a patent claim to a species within that genus). " ELI LILLY AND COMPANY v BARR LABORATORIES, INC., United States Court of Appeals for the Federal Circuit, ON PETITION FOR REHEARING EN BANC (DECIDED: May 30, 2001).

Claim Rejections - 35 USC § 102

5. 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 20-22, 24-26, 28-29, 31-32 and 38-39 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

Regarding, claim 20, Perez discloses the proximity sensor is activated manually (i.e. key-activity, talk condition, pressing / depressing the key or button, Page 2, ¶ [0017]) when the mobile station initiates an outgoing wireless telephone (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

With respect to claims 21, 28, Perez discloses a method of conserving battery power in a mobile station / a mobile station See i.e. radio communication apparatus, Title, Abstract), comprising: a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); a proximity sensor adapted to generate a signal indicative of proximity of an external object (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]); and a microprocessor adapted to (See e.g. 16 of Fig. 1, Page 1, ¶ [0013, 102 of Fig. 3, Page , 2 ¶ [0019]): (a) determine whether a telephone call is active (Se e.g. sensor can be used for detecting a user condition of the portable communication device such as a talk condition when the user is assumed to be talking on the portable communication device and the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]); (b) receive the signal from the proximity sensor (See e.g. signal, Page 1,¶ [0012]); and (c) reduce power to the display if (See e.g. reduce power, display, Page 1 ¶ [0013]) (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims 22, 29, Perez discloses (See e.g. the microprocessor the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]) reduces power to the display (See e.g. reduce power, display, Page 1 ¶ [0013]) only if (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims 24, 31, Perez discloses the proximity sensor causes display to be turned off / the display (See e.g. 56 of Fig. 2).

Regarding claims 25, 32 Perez discloses a mechanical proximity sensor, an optical sensor, and a range-detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claim 26, Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claims 38-39, Perez discloses detecting whether an external object is proximate substantially concurrently (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]) with the mobile station receiving an incoming telephone call (See e.g. when the mobile station (MS) inherently receiving incoming phone call, or MS inherently placing an out going call by keying / dialing the number on the keypad and speaking into the microphone or listening to the earpiece, Page 2, ¶ [0015]).

Claim Rejections - 35 USC § 103

7. 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.

8. Claims 23, 27, 30, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Her (U.S. Patent 5,712,911).

With respect to claims 23, 30, Perez discloses everything as discussed above in the rejected claims 21, 28. However, Perez dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered. In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Regarding claims 27, 33, it is obvious that the proximity sensor begins detecting (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call (that is when by depressing a key manually activating and out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020]).

Allowable Subject Matter

9. Claims 34-37 are objected to as being dependent upon a rejected base claim, but would be allowable if a proper terminal disclaimer filed and rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. **THIS ACTION IS MADE FINAL.** 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 mailing date of this final action.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

Kamran Afshar

GEORGE ENG
SUPERVISORY PATENT EXAMINER

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/516,316	09/06/2006	Norman Goris	Goris 10-10	9565

46900 7590 01/29/2007
MENDELSOHN & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
AFSHAR, KAMRAN	
ART UNIT	PAPER NUMBER
2617	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/29/2007	PAPER

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

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)
	11/516,316	GORIS ET AL.
	Examiner	Art Unit
	Kamran Afshar, 571-272-7796	2617

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *20 November 2006*.

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) *1-33* 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) *1-33* 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 *09/06/2006* 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/SB/08) Paper No(s)/Mail Date *09/06/2006*.

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

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

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

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 21, 23, 28, 30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Regarding claims 21 and 28, the original specification fails to support the newly add limitation " a microprocessor adapted to: determine whether a telephone call is active ", " determining whether a telephone call is active", " the incoming telephone call is automatically answered", as recited in the claims.

2. Claims 21, 23, 28, 30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Regarding claims 21 and 28, the original specification fails to support the newly add limitation " a microprocessor adapted to: determine whether a telephone call is active ", " determining whether a telephone call is active", " the incoming telephone call is automatically answered", as recited in the claims.

Claims 22-27 and 29-33 are rejected as they are directly and or indirectly depended on rejected claim.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "a microprocessor adapted to: determine whether a telephone call is active " determining whether a telephone call is active "," the incoming telephone call is

automatically answered", must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Double Patenting

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

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claims 1-33 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 7,113,811 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both basically claim the same

subject matter which includes: 1) A mobile station, 2) a chassis having a display, 3) a power reducer configured to control power consumption of said display, 4) a proximity sensor coupled to said chassis and configured to cause said power consumption to be reduced when said display is within a predetermined range of an external object, 5) and a microprocessor coupled to said proximity sensor coupled to said display, 6) said microprocessor configured to automatically activate said proximity sensor based on said mobile station receiving an incoming wireless telephone call, 7) proximity sensor causes said display to be turned off, etc.

"A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or **anticipated by**, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651 (affirming a holding of obviousness-type double patenting because the claims at issue were obvious over claims in four prior art patents); In re Berg, 140 F.3d at 1437, 46 USPQ2d at 1233 (Fed. Cir. 1998) (affirming a holding of obviousness-type double patenting where a patent application claim to a genus is anticipated by a patent claim to a species within that genus). " ELI LILLY AND COMPANY v BARR LABORATORIES, INC., United States Court of Appeals for the Federal Circuit, ON PETITION FOR REHEARING EN BANC (DECIDED: May 30, 2001).

Claim Rejections - 35 USC § 102

6. 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 a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before

November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 1-6, 8-13, 15-18, 20-22, 24-26, 28-29, and 31-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Perez (U.S. Pub. No.: 2004/0225904 A1).

With respect to claims 1, 8, 15, Perez discloses a method / a mobile station (See i.e. radio communication apparatus, Title, Abstract), comprising: a chassis having a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); power reducer configured to control power consumption of the display (See e.g. processor 16 of Fig. 1 is programmed to at least reduce power provided to the display the sensor detects the talk condition, Co Page 1, paragraph [0013]) and a proximity sensor (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1) coupled inherently to the chassis and activated based on the mobile station inherently wirelessly receiving a incoming telephone call (See e.g. Page 2, Paragraph [0014]) and / or a telephone call associated with mobile station (See talk condition involved a phone call starting, Page 2, Paragraph [0016]), the talk condition should generally be understood as the condition when a user is on an active call (that is when inherently the mobile station receiving incoming phone call.and speaking into the microphone or listening to the earpiece. A talk condition can be sensed in quite a number of ways, Page 2, Paragraph [0015], the talk condition is detected or sensed, at least one or more among the display, the backlight (for the display), or the backlight (See e.g. Page 3, for the by pressing or depressing keypad) can be turned off or at least operate at a reduced power level (i.e. power consumption of the display) Sensing a talk condition as an incoming phone call starts, e.g. Page 2, Paragraph [0016], and the power management would turn off or reduce power to the display, e.g. page 2, Paragraph [0016]), the proximity sensor adapted to cause a power consumption of (i.e. conserving power) display (See e.g. 10, 12, 24, 26, 28, 30 of Fig. 1) to be reduced and / or turned off (See e.g. 56 of Fig. 2) when display is within a predetermined range (i.e. predetermined angle-range, position, volume, spectrum energy or density) of an external object (See e.g. user's head , user's ear, user's face, user's hand, user's pocket, or bag, etc. Page 2, Paragraph [0015]) and / or during a telephone call (See e.g. Page 1, Paragraph [0009], Page 3, Paragraph [0020]).

Regarding claims 2, 9, 24, 31, Perez discloses the proximity sensor causes display to be turned off / the display(See e.g. 56 of Fig. 2).

Regarding claims 3, 10, Perez discloses the proximity sensor causes power consumption to be reduced when display is within predetermined range during the telephone call (See e.g. talk condition, 56 of Fig. 2, Page 3, Paragraph [0020]).

Regarding claims 4, 11, 16, 25, 32 Perez discloses a mechanical proximity sensor, an optical sensor, and a range detecting sensor (See e.g. 24, 26, 28, 30 of Fig. 1).

Regarding claims 5, 17, 26, Perez discloses the proximity sensor is located proximate the display (See e.g. 12, 24, of Fig. 1).

Regarding claim 6, Perez discloses the proximity sensor is activated automatically (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) when telephone call is (inherently) a wireless incoming call (that is when the mobile station starts an active call receiving an incoming call which is one of many ways of the talk condition, See Page 2, Paragraph [0016]) and is activated manually when telephone call is a wireless outgoing call (that is when by depressing a key manually activating and out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020]).

Regarding claim 18, Perez discloses the proximity sensor is located on a speaker side of chassis (See e.g. 10, 24, 26, 28, 30 of Fig. 1).

Regarding claim 12, Perez discloses the proximity sensor is activated based on user interaction with a keypad (i.e. key-activity, talk condition, pressing / depressing the key or button, etc.) of the mobile station when the telephone call is outgoing call (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

Regarding, claim 13, Perez discloses causing the power consumption to be reduced independent of whether the mobile station is being used during the telephone call (See Perez e.g. sensor or sensors 100, and automatic adjusting power consumption and / or the sensor is activated automatically, Page, 2, Paragraph [0019]).

Regarding, claim 20, Perez discloses the proximity sensor is activated manually (i.e. key-activity, talk condition, pressing / depressing the key or button, Page 2, ¶ [0017]) when the mobile station initiates an outgoing wireless telephone (See Perez e.g. Page 2, Paragraphs [0017]-[0018]).

With respect to claims 21, 28, Perez discloses a method of conserving battery power in a mobile station / a mobile station See i.e. radio communication apparatus, Title, Abstract), comprising: a display (i.e. enclosure, housing, main body, display 12 of Fig. 1, etc.); a proximity sensor adapted to generate a signal indicative of proximity of an external object (See e.g. short range detector or sensors 24, 26, 28 or 30 of Fig. 1, determine the proximity of a user's head to an earpiece, Page 1, ¶ [0009]); and a microprocessor adapted to (See e.g. 16 of Fig. 1, Page 1, ¶ [0013, 102 of Fig. 3, Page , 2 ¶ [0019]): (a) determine whether a telephone call is active (Se e.g. sensor can be used for detecting a user condition of the portable communication device such as a talk condition when the user is assumed to be talking on the portable communication device and the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]); (b) receive the signal from the proximity sensor (See e.g. signal, Page 1,¶ [0012]); and (c) reduce power to the display if (See e.g. reduce power, display, Page 1 ¶ [0013]) (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Regarding claims 22, 29, Perez discloses (See e.g. the microprocessor the processor can be programmed to at least reduce power provided to the light source when the sensor detects the talk condition, Page 1, ¶ [0007]) reduces power to the display (See e.g. reduce power, display, Page 1 ¶ [0013]) only if (i) the microprocessor determines that a telephone call is active (See e.g. active call, Page 2, ¶ [0014]) and (ii) the signal indicates the proximity of the external object (See e.g. a talk condition can be sensed by measuring at least one among a spectrum density or a spectrum energy of a bounced signal to determine the proximity of a user's head to an earpiece of the portable communication device using a microphone or a proximity sensor 24, Page 2, ¶ [0015]).

Claim Rejections - 35 USC § 103

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

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

9. Claims 7, 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Sawada (U.S. Pub. No.: 2002/084998 A1).

With respect to claims 7, 14, 19, Perez discloses everything as discussed above in the rejected claims 1, 8, 15. In an analogous field of endeavor, Perez further discloses the proximity sensor is measuring the distance and / or the range of proximity of the user ear (i.e. user's head to earpiece, See Co. 2, ¶ [0015]) the mobile station. However, Perez does not explicitly disclose the predetermined range is about five centimeters. Sawada discloses the predetermined range is about five centimeters (See Sawada e.g. 21a, 37 of Fig. 1, Page 3, ¶ [0037]). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Sawada to Perez to set the range about five centimeters to the external object (i.e. the user ear, a pocket, and or a bag) so that the proximity sensor measuring the range (i.e. distance, threshold, etc.) is aware of the area surrounding the mobile station (See Sawada e.g. Page 1, ¶ [0009]), and the predetermine range (i.e. threshold) is set in as a few centimeters (See Sawada e.g. Page 3, ¶ [0037]).

10. Claims 23, 27, 30, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Her (U.S. Patent 5,712,911).

With respect to claims 23, 30, Perez discloses everything as discussed above in the rejected claims 21, 28. However, Perez dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered. In an analogous field of endeavor, Her discloses a vigoursely well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and

microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See e.g. Co. 2, Lines 41-50). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Regarding claims 27, 33, it is obvious that the proximity sensor begins detecting (See e.g. the automatic adjustment can lower the power consumption, Page 2, Paragraph [0019]) whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call (that is when by depressing a key manually activating and out going dispatch call is outgoing, See e.g. Page 3, Lines 14-23 of Paragraph [0020]).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Boireau (U.S. Pub. No.: 2004/0252115 A1).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Kamran Afshar whose telephone number is (571) 272-7796. The examiner can be reached on Monday-Friday.

If attempts to reach the examiner by the telephone are unsuccessful, the examiner's supervisor, **Eng, George** can be reached @ (571) 272-3984. The fax number for the organization where this application or proceeding is assigned is **571-273-8300** for all communications.

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).

Kamran Afshar

K. A.

George Eng
GEORGE ENG
SUPERVISORY PATENT EXAMINER

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	Goris 11-11-N-USA	7512

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EXAMINER	
WANG-HURST, KATHY W	

ART UNIT	PAPER NUMBER
2617	

MAIL DATE	DELIVERY MODE
08/08/2011	PAPER

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

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

Office Action Summary	Application No.	Applicant(s)
	11/945,505	GORIS ET AL.
	Examiner	**Art Unit**
	KATHY WANG-HURST	2617

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event however may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will by statute, cause the application to become ABANDONED (35 U.S.C. § 133) Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1 704(b)

Status

1)☒ Responsive to communication(s) filed on *04 April 2011*.

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) *1-14* 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) *1-14* 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/SB/08) Paper No(s)/Mail Date *4/4/2011*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ______ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: ______.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 4/4/2011 has been entered.

Notice of allowance

2. Prosecution on the merits of this application is reopened on claims 1-14 and the indicated allowability of claims 1-14 is withdrawn in view of the newly discovered reference(s) to Motoki Katsumasa (JP2002111801), as provided by the applicant's IDS. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 102

3. 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 –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2, 4-9, 11-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Motoki Katsumasa (JP2002111801, hereinafter Katsumasa), provided by the applicant submitted IDS.

Regarding claim 1, Katsumasa discloses the mobile station (see Katsumasa, Fig. 1, a mobile phone), comprising:

a display (see Katsumasa, Fig. 1, display 12);

a proximity sensor (see Katsumasa, Fig. 1, distance sensor 18) adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate (see Katsumasa, [0009][0055], distance sensor sending the distance is less than a predetermined distance, CPU determines that the device is in the ordinary conversation position near the user's ear); and

a microprocessor (see Katsumasa, Fig. 4, CPU 21) adapted to:

(a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that a telephone call is active (see Katsumasa, [0010] audio level detecting means for detecting the level of audio signals inputted from the microphone to determine if the device is used in a phone conversation);

(b) receive the signal from the proximity sensor (see Katsumasa, [0010] [0020] receiving distance measurement signals from distance detecting sensor); and

(c) reduce power to the display if both the first and second conditions exist (see Katsumasa, [0010][0012] turning off the display when both distance condition and audio level condition are met).

Regarding claim 8, Katsumasa discloses the method of conserving battery power in a mobile station (see Katsumasa, [0012] turning off un-used functions to save power), comprising:

the mobile station detecting the existence of a first condition, the first condition being that an external object is proximate(see Katsumasa, [0009][0055], distance sensor sending the distance is less than a predetermined distance, CPU determines that the device is in the ordinary conversation position near the user's ear);

the mobile station detecting the existence of a second condition independent and different from the first condition, the second condition being that a telephone call is active (see Katsumasa, [0010] audio level detecting means for detecting the level of audio signals inputted from the microphone to determine if the device is used in a phone conversation); and

the mobile station reducing power consumption of a display of the mobile station if both the first and second conditions exist (see Katsumasa, [0010][0012] turning off the display when both distance condition and audio level condition are met).

Regarding claim 14, Katsumasa discloses the mobile station (see Katsumasa, Fig. 1, a mobile phone), comprising:

a display(see Katsumasa, Fig. 1, display 12);

a proximity sensor (see Katsumasa, Fig. 1, distance sensor 18) adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate (see Katsumasa, [0009][0055], distance sensor sending the distance is less than a predetermined distance, CPU determines that the device is in the ordinary conversation position near the user's ear); and

a microprocessor (see Katsumasa, Fig. 4, CPU 21) adapted to:

(a) determine, independently of the determination whether the external object is proximate, the existence of a second condition different from the first condition, the second condition being that a telephone call is active (see Katsumasa, [0010] in addition to the distance detecting, audio level detecting means for detecting the level of audio signals inputted from the microphone to determine if the device is used in a phone conversation);

(b) receive the signal from the proximity sensor (see Katsumasa, [0010] [0020] receiving distance measurement signals from distance detecting sensor); and

(c) reduce power to the display if both the first and second conditions exist (see Katsumasa, [0010][0012] turning off the display when both distance condition and audio level condition are met).

Regarding claim 2, Katsumasa discloses the mobile station of claim 1, wherein the microprocessor reduces power to the display only if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object (see Katsumasa, [0010] [0020] receiving distance measurement signals from distance detecting sensor).

Regarding claim 4, Katsumasa discloses the mobile station as recited in claim 1, wherein the microprocessor reduces power to the display by turning off the display (see Katsumasa, [0010][0012] turning off the display).

Regarding claim 5, Katsumasa discloses the mobile station as recited in claim 1, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor (see Katsumasa, [0020] distance detecting sensor).

Regarding claim 6, Katsumasa discloses the mobile station as recited in claim 1, wherein the proximity sensor is located proximate to the display (see Katsumasa, Fig. 1, distance sensor 18 is located close to display 12).

Regarding claim 7, Katsumasa discloses the mobile station as recited in claim 1, wherein the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call (see Katsumasa, [0010] [0020] detecting distance between the phone and user's ear when the user is on a phone conversation).

Regarding claim 9, Katsumasa discloses the method of claim 8, wherein the power consumption of the display is reduced only if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected (see Katsumasa, [0010][0012] turning off the display when both distance condition and audio level condition are met).

Regarding claim 11, Katsumasa discloses the method as recited in claim 8, wherein reducing power consumption of the display comprises turning off the display (see Katsumasa, [0012] turning off the display when not used).

Regarding claim 12, Katsumasa discloses the method as recited in claim 8, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor (see Katsumasa, [0020]).

Regarding claim 13, Katsumasa discloses the method as recited in claim 8, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing telephone call (see Katsumasa, [0010] [0020] detecting distance between the phone and user's ear when the user is on a phone conversation).

Claim Rejections - 35 USC § 103

5. 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.

6. Claims 3 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perez (U.S. Pub. No.: 2004/0225904 A1) in view of Her (U.S. Patent 5,712,911).

Regarding claim 3, Perez discloses every limitation as discussed above in the rejected claim 1, respectively, except that Perez dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See Her, e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See Her, e.g. Co. 2, Lines 41-50).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Regarding claim 10, Katsumasa discloses the method of claim 8, but does not specifically disclose further comprising: if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then the mobile station automatically answering the incoming telephone call.

In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See Her, e.g. Co. 2, Lines 41-50).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Perez to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATHY WANG-HURST whose telephone number is (571)270-5371. The examiner can normally be reached on Monday-Thursday, 7:30am-5pm, alternate Fridays, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamran Afshar can be reached on (571) 272-7796. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/KATHY WANG-HURST/
Examiner, Art Unit 2617

CUSTOMER NO. 46900 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. Goris 11-11-N-USA

In re application of: Norman Goris et al.

Serial No.:	11/945,505	Group Art Unit:	2617
Filed:	11/27/07	Examiner:	Kathy W. Wang-Hurst
Matter No.:	992.1428	Phone No.:	571-272-7796

For: System and Method for Conserving Battery Power in a Mobile Station

AMENDMENT UNDER 37 CFR 1.111

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

Dear Sir:

This Amendment is filed in response to the non-final office action of 8/8/11.

CLAIMS

1. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and

a microprocessor adapted to:

(a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call ~~a telephone call is active~~;

(b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor;

(c) ~~(b)~~ receive the signal from the activated proximity sensor; and

(d) ~~(c)~~ reduce power to the display if the signal from the activated proximity sensor indicates that ~~both~~ the first ~~and second~~ conditions exists.

2. (Currently Amended) The mobile station of claim 1, further comprising increasing power to the display if the signal from the activated proximity sensor indicates that the first condition no longer exists ~~wherein the microprocessor reduces power to the display only if (i) the microprocessor determines that a telephone call is active and (ii) the signal indicates the proximity of the external object~~.

3. (Original) The mobile station of claim 1, wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

4. (Original) The mobile station as recited in claim 1, wherein the microprocessor reduces power to the display by turning off the display.

5. (Original) The mobile station as recited in claim 1, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

6. (Original) The mobile station as recited in claim 1, wherein the proximity sensor is

located proximate to the display.

7. (Original) The mobile station as recited in claim 1, wherein the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call.

8. (Currently Amended) A method of conserving battery power in a mobile station, ~~comprising:~~ the mobile station adapted to detect~~ing~~ the existence of a proximity ~~first~~ condition, the proximity ~~first~~ condition being that an external object is proximate, the method comprising: ~~;~~

the mobile station detecting the existence of an ~~second~~ initiated-call condition or an answered-call condition independent and different from the proximity ~~first~~ condition, the initiated-call condition being that a user of the mobile station has performed an action to initiate a call, and the ~~second~~ answered-call condition being that a user of the mobile station has performed an action to answer a call ~~a telephone call is active~~;

the mobile station activating the proximity sensor in response to a determination that an answered-call condition or initiated-call condition exists; and

the mobile station reducing power consumption of a display of the mobile station if the activated proximity sensor indicates that ~~both~~ the ~~first and second~~ proximity condition~~s~~ exists.

9. (Currently Amended) The method of claim 8, further comprising the mobile station increasing power consumption of the display if the signal from the activated proximity sensor indicates that the proximity condition no longer exists ~~wherein the power consumption of the display is reduced only if (i) a telephone call is determined to be active and (ii) the proximity of the external object is detected~~.

10. (Previously Presented) The method of claim 8, further comprising:

if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then the mobile station automatically answering the incoming telephone call.

11. (Original) The method as recited in claim 8, wherein reducing power consumption of the display comprises turning off the display.

12. (Original) The method as recited in claim 8, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor.

13. (Original) The method as recited in claim 8, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing telephone call.

14. (Currently Amended) A mobile station, comprising:

a display;

a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and

a microprocessor adapted to:

(a) determine, independently of the determination whether the external object is proximate, the existence of a second condition different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call ~~a telephone call is active~~;

(b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor;

(c) ~~(b)~~ receive the signal from the activated proximity sensor; and

(d) ~~(c)~~ reduce power to the display if the signal from the activated proximity sensor indicates that ~~both~~ the first ~~and second~~ condition~~s~~ exists.

REMARKS/ARGUMENTS

Claims 1-14 are pending in the application. Claims 1, 2, 8, 9, and 14 are amended herein. The Applicant hereby requests examination of the application in view of the foregoing amendments and these remarks.

Art Rejections

In paragraph 3 of the office action, the Examiner rejected claims 1, 2, 4-9, and 11-14 under 35 U.S.C. §102(b) as anticipated by JP2002111801 ("Katsumasa"). In paragraph 6, the Examiner rejected claims 3 and 10 under 35 U.S.C. §103(a) as obvious over U.S. Patent Application Pub. No. 2004/0225904 ("Perez") in view of U.S. Patent No. 5,712,911 ("Her").

For the following reasons, the Applicant submits that all of the now-pending claims are allowable over the cited references.

Claim 1, as amended herein, recites:

> 1. A mobile station, comprising:
> a display;
> a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and
> a microprocessor adapted to:
> (a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, **the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call**;
> (b) **in response to a determination in step (a) that the second condition exists, activate the proximity sensor**;
> (c) receive the signal from the activated proximity sensor; and
> (d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists.

Support for the amendments to claims 1, 8, and 14 is found in the specification, e.g., at p. 3, lines 21-24 and lines 32-33.

Claim 1 stands rejected as anticipated by Katsumasa. Amended claim 1 requires that the proximity detector be activated in response to the determination in step (a) that the second condition (e.g., that a telephone call is active) exists. In Katsumasa, the distance sensor 18 is always activated, on a full-time basis (see, e.g., paragraph [0033], [0036], [0038], [0039], and [0040] of Katsumasa), rather than being activated in response to a determination that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call.

Nor do the other two cited references supply these missing teachings. Although Perez and Her were not specifically cited against claim 1, neither of these references discloses activating a proximity sensor in response to a determination that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call. As in Katsumasa, Perez employs one or more sensors to detect a "talk condition," which sensors are always activated, on a full-time basis (see, e.g., paragraphs

[0015] and [0018] of Perez). Likewise, Her's distance sensor 18 is always activated (see, e.g., col. 4, lines 23-42).

Since none of the cited references discloses that the proximity detector be activated in response to the determination in step (a) that the second condition exists (i.e., that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call), none of these references, whether taken alone or in combination, can anticipate or render obvious claim 1.

For similar reasons, amended claims 8 and 14 are also patentable over the cited references. Since the remaining claims depend variously from claims 1 and 8, it is further submitted that those claims are also allowable over the cited references.

Conclusion

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Fees

During the pendency of this application, the Commissioner for Patents is hereby authorized to charge payment of any filing fees for presentation of extra claims under 37 CFR 1.16 and any patent application processing fees under 37 CFR 1.17 or credit any overpayment to Mendelsohn, Drucker, & Associates, P.C. Deposit Account No. 50-0782.

The Commissioner for Patents is hereby authorized to treat any concurrent or future reply, requiring a petition for extension of time under 37 CFR § 1.136 for its timely submission, as incorporating a petition for extension of time for the appropriate length of time if not submitted with the reply.

Respectfully submitted,

Date: November 7, 2011
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	Goris 11-11-N-USA	7512

46900 7590 12/14/2011
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EXAMINER	
WANG-HURST, KATHY W	

ART UNIT	PAPER NUMBER
2617	

MAIL DATE	DELIVERY MODE
12/14/2011	PAPER

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

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

PTOL-90A (Rev. 04/07)

Office Action Summary	**Application No.**	**Applicant(s)**
	11/945,505	GORIS ET AL.
	Examiner	**Art Unit**
	KATHY WANG-HURST	2617

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☒ Responsive to communication(s) filed on *07 November 2011*.

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) *1-14* 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) *1-14* 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/SB/08) Paper No(s)/Mail Date *11/7/2011*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 11/7/2011 have been fully considered but they are not persuasive.

Regarding the applicant's argument the amended limitation would overcome the rejections because Katsumasa does not teach activating the proximity sensor in response to the step (a) that there exists a telephone call, as Katsumasa's distance sensor is always activated on a full-time basis (see argument page 5), the examiner respectfully disagrees. Katsumasa teaches when a line/call is established with another party, the device enters conversation mode, and in this state, it is determined whether or not the voice mode switch 16 has been turned ON (see Katsumasa, Fig. 5, Step A1 and Step A2; [0033]). If the switch 16 is OFF, the distance between the device 10 and the user is measured by the distance sensor, thus activating the distance sensor (see Katsumasa, [0035] and Fig. 5, Step A3). If the switch 16 is ON, the operating environment for the call is established and the procedure goes to Steps A7-A9 (see Katsumasa, [0033] and Fig. 5). In other words, upon an incoming/outgoing phone call, the device senses whether or not the user has pushed switch 16 to accept/start the conversation. If switch 16 is pushed, the user accepts and/or starts the phone conversation and the phone shuts off display to conserve power. If switch 16 is not pushed, the phone starts to determine the distance between the phone and the user by activating the distance sensor. Therefore, the distance sensor is only activated after the fact that there is a call and the switch 16 is not pushed by the user. It is very clear that from flow chart in Fig. 5, the steps A3-A6 are skipped if the switch 16 is pushed ON by user after there is a phone call in A1. In other words, none of the steps A2-A13 would occur unless there is a phone call as indicated in A1. Therefore, Katsumasa teaches the amended limitations, as follows.

Claim Rejections - 35 USC § 103

2. 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.

3. Claims 1-2, 4-9, 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Motoki Katsumasa (JP2002111801, hereinafter Katsumasa), provided by the applicant submitted IDS.

Claims 1-2, 4-9, 11-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Motoki Katsumasa (JP2002111801, hereinafter Katsumasa), provided by the applicant submitted IDS.

Regarding claim 1, Katsumasa discloses the mobile station (see Katsumasa, Fig. 1, a mobile phone), comprising:

a display (see Katsumasa, Fig. 1, display 12);

a proximity sensor (see Katsumasa, Fig. 1, distance sensor 18) adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate (see Katsumasa, [0009][0055], distance sensor sending the distance is less than a predetermined distance, CPU determines that the device is in the ordinary conversation position near the user's ear); and

a microprocessor (see Katsumasa, Fig. 4, CPU 21) adapted to:

(a) determine, without using the proximity sensor, the existence of a second condition independent and different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call (see Katsumasa, [0033] and Fig. 5, Step A1, there is a telephone call, which may be an incoming call or outgoing call; Step A2, the user may push switch 16 to start conversation or simply waits and places the phone against user's ear, [0035], thus waiting and placing phone to user's ear is an action performed by user);

(b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor (see Katsumasa, [0036] and Fig. 5, step A3, start measuring distance using the distance sensor after it is detected there is a phone call and switched 16 is not turned ON by user);

(c) receive the signal from the activated proximity sensor (see Katsumasa, [0010] [0020] [0036] and Fig. 5, step A3, receiving distance measurement signals from activating the distance detecting sensor); and

(d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists (see Katsumasa, [0010][0012] [0038] turning off the display when certain conditions are met, e.g. when the distance measured by distance sensor is less than the predetermined value).

Note that the applicant amended the limitation in (a) in such a way that it infers that an active action must be performed by the user, i.e. pressing a key or a switch in response to a phone call. However, as wireless technology advances, many user actions can be replaced by automation. In this case, instead of a user pressing a key or a switch to answer or initiate a call, the user may simply hold the mobile phone and wait for the phone to handle the call based on certain conditions being met, e.g. close distance between the user and the phone (see Katsumasa, [0038]).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to replace a user action with automatic detection to yield the same results (shutting off display to conserve energy when user is engaged in a phone conversation), as taught by Katsumasa, thus allowing optimum operating environment to be set automatically without any input from the user (see Katsumasa, [0045]).

Regarding claim 8, Katsumasa discloses the method of conserving battery power in a mobile station (see Katsumasa, [0012] turning off un-used functions to save power), the mobile station adapted to detect the existence of a proximity condition, the proximity condition being that an external object is proximate, the method comprising (see Katsumasa, [0009][0055], distance sensor sending the distance is less than a predetermined distance, CPU determines that the device is in the ordinary conversation position near the user's ear):

the mobile station detecting the existence of an initiated-call condition or an answered- call condition independent and different from the proximity condition, the initiated-call condition being that a user of the mobile station has performed an action to initiate a call, and the answered- call condition being that a user of the mobile station has performed an action to answer a call ([0033] and Fig. 5, Step A1, a phone call is established with another party, thus the call may be an incoming call or outgoing call);

the mobile station activating the proximity sensor in response to a determination that an answered-call condition or initiated-call condition exists (see Katsumasa, [0033] and Fig. 5, Step A1, there is a telephone call, which may be an incoming call or outgoing call; Step A2, the user may push switch 16 to start conversation or simply waits and places the phone against user's ear, [0035], thus waiting and placing phone to user's ear is an action performed by user); and

the mobile station reducing power consumption of a display of the mobile station if the activated proximity sensor indicates that_the proximity condition exists (see Katsumasa, [0010][0012] turning off the display when both distance condition and audio level condition are met).

Note that the applicant amended the limitation in (a) in such a way that it infers that an active action must be performed by the user, i.e. pressing a key or a switch in response to a phone call. However, as wireless technology advances, many user actions can be replaced by automation. In this case, instead of a user pressing a key or a switch to answer or initiate a call, the user may simply hold the mobile phone and wait for the phone to handle the call based on certain conditions being met, e.g. close distance between the user and the phone (see Katsumasa, [0038]).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to replace a user action with automatic detection to yield the same results (shutting off display to conserve energy when user is engaged in a phone conversation), as taught by Katsumasa, thus allowing optimum operating environment to be set automatically without any input from the user (see Katsumasa, [0045]).

Regarding claim 14, Katsumasa discloses the mobile station (see Katsumasa, Fig. 1, a mobile phone), comprising:

a display(see Katsumasa, Fig. 1, display 12);

a proximity sensor (see Katsumasa, Fig. 1, distance sensor 18) adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate (see Katsumasa, [0009][0055], distance sensor sending the distance is less than a predetermined distance, CPU determines that the device is in the ordinary conversation position near the user's ear); and

a microprocessor (see Katsumasa, Fig. 4, CPU 21) adapted to:

(a) determine, independently of the determination whether the external object is proximate, the existence of a second condition different from the first condition, the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call (see Katsumasa, [0033] and Fig. 5, Step A1, there is a telephone call, which may be an incoming call or outgoing call; Step A2, the user may push switch 16 to start conversation or simply waits and places the phone against user's ear, [0035], thus waiting and placing phone to user's ear is an action performed by user);

(b) in response to a determination in step (a) that the second condition exists, activate the proximity sensor (see Katsumasa, [0036] and Fig. 5, step A3, start measuring distance using the distance sensor after it is detected there is a phone call and switched 16 is not turned ON by user);

(c) receive the signal from the activated proximity sensor (see Katsumasa, [0010] [0020] [0036] and Fig. 5, step A3, receiving distance measurement signals from activating the distance detecting sensor); and

(d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists (see Katsumasa, [0010][0012] [0038] turning off the display when certain conditions are met, e.g. when the distance measured by distance sensor is less than the predetermined value).

Note that the applicant amended the limitation in (a) in such a way that it infers that an active action must be performed by the user, i.e. pressing a key or a switch in response to a phone call. However, as wireless technology advances, many user actions can be replaced by automation. In this case, instead of a user pressing a key or a switch to answer or initiate a call, the user may simply hold the mobile phone and wait for the phone to handle the call based on certain conditions being met, e.g. close distance between the user and the phone (see Katsumasa, [0038]).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to replace a user action with automatic detection to yield the same results (shutting off display to conserve energy when user is engaged in a phone conversation), as taught by Katsumasa, thus allowing optimum operating environment to be set automatically without any input from the user (see Katsumasa, [0045]).

Regarding claims 2 and 9, Katsumasa discloses the mobile station of claim 1, and the method of claim 8, further comprising increasing power to the display if the signal from the activated proximity sensor indicates the first condition no longer exists (see Katsumasa, [0040] [0042] turning on display if distance is greater than the predetermined distance).

Regarding claim 4, Katsumasa discloses the mobile station as recited in claim 1, wherein the microprocessor reduces power to the display by turning off the display (see Katsumasa, [0010][0012] turning off the display).

Regarding claim 5, Katsumasa discloses the mobile station as recited in claim 1, wherein the proximity sensor is a mechanical proximity sensor, an optical sensor, or a range-detecting sensor (see Katsumasa, [0020] distance detecting sensor).

Regarding claim 6, Katsumasa discloses the mobile station as recited in claim 1, wherein the proximity sensor is located proximate to the display (see Katsumasa, Fig. 1, distance sensor 18 is located close to display 12).

Regarding claim 7, Katsumasa discloses the mobile station as recited in claim 1, wherein the proximity sensor begins detecting whether an external object is proximate substantially concurrently with the mobile station initiating an outgoing telephone call (see Katsumasa, [0010] [0020] detecting distance between the phone and user's ear when the user is on a phone conversation).

Regarding claim 11, Katsumasa discloses the method as recited in claim 8, wherein reducing power consumption of the display comprises turning off the display (see Katsumasa, [0012] turning off the display when not used).

Regarding claim 12, Katsumasa discloses the method as recited in claim 8, wherein the detecting of the proximity of the external object is performed by a mechanical proximity sensor, an optical sensor, or a range-detecting sensor (see Katsumasa, [0020]).

Regarding claim 13, Katsumasa discloses the method as recited in claim 8, wherein detecting whether an external object is proximate begins substantially concurrently with the mobile station initiating an outgoing telephone call (see Katsumasa, [0010] [0020] detecting distance between the phone and user's ear when the user is on a phone conversation).

4. Claims 3 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katsumasa in view of Her (U.S. Patent 5,712,911).

Regarding claim 3, Katsumasa discloses every limitation as discussed above in the rejected claim 1, respectively, except that Katsumasa dose not explicitly disclose wherein, if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered.

In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See Her, e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See Her, e.g. Co. 2, Lines 41-50).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Katsumasa to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Regarding claim 10, Katsumasa discloses the method of claim 8, but does not specifically disclose further comprising: if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then the mobile station automatically answering the incoming telephone call.

In an analogous field of endeavor, Her discloses a vigorously well known system and or method for proximity sensor for sensing the presence or absence of a subscriber within a predetermined proximity zone, and microprocessor (See e.g. 18, 20 of Fig. 1) for automatically activating the speakerphone in response to an incoming call (See Her, e.g. Co. 2, Lines 41-50).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to provide above teaching of Her to Katsumasa to provide a portable telephone including speakerphone that bypasses the use of a manually operated push speakerphone button when responding to an incoming call via speakerphone (See Her, Co. 2, Lines 51-54).

Conclusion

5. **THIS ACTION IS MADE FINAL.** 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 mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATHY WANG-HURST whose telephone number is (571)270-5371. The examiner can normally be reached on Monday-Thursday, 7:30am-5pm, alternate Fridays, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamran Afshar can be reached on (571) 272-7796. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/KATHY WANG-HURST/
Examiner, Art Unit 2617

/KAMRAN AFSHAR/

Supervisory Patent Examiner, Art Unit 2617

CUSTOMER NO. 46900 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. Goris 11-11-N-USA

In re application of: Norman Goris et al.

Serial No.:	11/945,505	Group Art Unit:	2617
Filed:	11/27/07	Examiner:	Kathy W. Wang-Hurst
Matter No.:	992.1428	Phone No.:	571-272-7796

For: System and Method for Conserving Battery Power in a Mobile Station

RESPONSE UNDER 37 CFR 1.116

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

Dear Sir:

This Response is filed in response to the final office action of 12/14/11.

REMARKS/ARGUMENTS

Claims 1-14 are pending in the application. The Applicant hereby requests examination of the application in view of these remarks.

Art Rejections

In paragraph 3 of the final office action, the Examiner rejected claims 1, 2, 4-9, and 11-14 both (i) under 35 U.S.C. §102(b) as anticipated by JP2002111801 ("Katsumasa") and (ii) under 35 U.S.C. §103(a) as obvious over Katsumasa. In paragraph 4, the Examiner rejected claims 3 and 10 under 35 U.S.C. §103(a) as obvious over Katsumasa in view of U.S. Patent No. 5,712,911 ("Her").

For the following reasons, the Applicant submits that all of the claims are allowable over the cited references.

Claims 1-14

Claim 1 recites:

1. A mobile station, comprising:
a display;
a proximity sensor adapted to generate a signal indicative of the existence of a first condition, the first condition being that an external object is proximate; and
a microprocessor adapted to:
(a) determine, **without using the proximity sensor**, the existence of a second condition independent and different from the first condition, **the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call**;
(b) **in response to a determination in step (a) that the second condition exists, activate the proximity sensor**;
(c) receive the signal from the activated proximity sensor; and
(d) reduce power to the display if the signal from the activated proximity sensor indicates that the first condition exists.

Claim 1 stands rejected as anticipated by, and obvious over, Katsumasa. Claim 1 requires that the proximity detector be activated in response to the determination in step (a) that the second condition (e.g., that a telephone call is active) exists. The determination in step (a) must be made without using the proximity sensor, according to the language of claim 1.

The Examiner argued on page 4 of the office action that a user in Katsumasa performs an action to initiate an outgoing call or to answer an incoming call by either (i) pushing switch 16 or (ii) placing the phone to the user's ear. However, Katsumasa fails to provide the requisite teachings, as will now be explained.

Scenario (i) – pushing switch 16: In Katsumasa, if the user pushes switch 16 to initiate an outgoing call or to answer an incoming call (the Examiner's scenario (i)), then, as shown in FIG. 5, signals from the proximity sensor are not used to reduce power to the display. Instead, steps A3 (measuring distance with the distance sensor 18) and A4 (determining whether the distance sensor's output meets a predetermined threshold) are skipped, and the method proceeds directly to step A7 to reduce power to the camera, display, and lighting. Accordingly, the user's press of switch 16 does not satisfy the recitation of step (b), namely, "in response to a determination in step (a) that the second condition exists, **activate the proximity sensor**." Indeed, at no point during this process is the proximity sensor "activated," either explicitly or implicitly. Rather, the proximity sensor **is not even used**, once the user pushes switch 16 to initiate an outgoing call or to answer an incoming call.

Scenario (ii) – placing the phone to the user's ear: On the other hand, if the user in Katsumasa does not push switch 16 to initiate an outgoing call or to answer an incoming call and instead places the phone to the user's ear (the Examiner's scenario (ii)), then **that placement of the phone to the user's ear is detected by the distance sensor 18** (see, e.g., paragraph [0036]). Accordingly, this scenario does not satisfy the explicit recitation of step (a), namely, determining, "**without using the proximity sensor**," the existence of a second condition independent and different from the first condition.

Since, in scenario (i), the proximity sensor is not activated in response to a determination that the second condition exists, and since in scenario (ii), a second condition independent and different from the first condition is not determined "without using the proximity sensor," Katsumasa fails to teach, disclose, or even suggest either of steps (a) or (b) and therefore fails to anticipate or render obvious claim 1.

Moreover, in Katsumasa, in either scenario (i) or scenario (ii), the distance sensor is always activated, on a full-time basis, rather than being activated in response to a determination that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call, as required by claim 1. This is evident from statements in Katsumasa such as the following (emphasis added):

> "The voice mode switch 16 is used explicitly by the user to conduct a phone call. When the voice mode switch 16 has been turned ON (Yes in Step A2), the operating environment for a phone call is established **regardless of the distance sensor 18** (Steps A7-A9)" (Para. [0033]).
>
> "When the voice mode switch 16 has been turned ON (Yes in Step B2), the operating environment for a phone call is established **regardless of the distance sensor 18** (Steps B3-B5)" (Para. [0053]).

The foregoing statements make it clear that, in Katsumasa, the distance sensor is still measuring distance, even while those measurements are being ignored by the processor. When distance sensing is not needed, the distance sensor is not deactivated. In fact, nowhere does Katsumasa even mention activating or deactivating the distance sensor. Rather, Katsumasa teaches proceeding to establish the (reduced-power state) environment for a phone call "**regardless**" of the distance sensor, i.e., regardless of the signals being generated by the distance sensor. Since Katsumasa's distance sensor is always active, Katsumasa cannot possibly teach, disclose, or even suggest, step (b), namely, "in response to a determination in step (a) that the second condition exists, activat[ing] the proximity sensor."

For all of the foregoing reasons, Katsumasa cannot anticipate or render obvious claim 1.

For similar reasons, claims 8 and 14 are also patentable over the cited references. Since the remaining claims depend variously from claims 1 and 8, it is further submitted that those claims are also allowable over the cited references.

Claims 3 and 10

Claims 3 and 10 stand rejected as obvious over Katsumasa and Her. In rejecting claim 3, the Examiner admitted that Katsumasa fails to teach the following feature recited in claim 3 but asserts that Her provides the missing teachings: "if (i) the microprocessor determines that an incoming telephone call arrives at the mobile station and (ii) the signal indicates the proximity of the external object, then the incoming telephone call is automatically answered." In rejecting claim 10, the Examiner admitted that Katsumasa fails to teach the following feature recited in claim 10 but asserts that Her provides the missing teachings: "if (i) an incoming telephone call is determined to arrive at the mobile station and (ii) the proximity of the external object is detected, then the mobile station automatically answering the incoming telephone call."

These rejections of claims 3 and 10 rely solely upon Her as allegedly disclosing the foregoing recitations of claims 3 and 10. However, Her fails to address the deficiencies of Katsumasa that are identified above in the discussion of the rejection of claim 1. Therefore, no combination of Katsumasa and Her could possibly render claim 3 or claim 10 obvious, and the rejection of claims 3 and 10 as obvious over Katsumasa and Her should be withdrawn.

The foregoing provides additional reasons for the patentability of claims 3 and 10 over the cited references.

Conclusion

In view of the above remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Fees

During the pendency of this application, the Commissioner for Patents is hereby authorized to charge payment of any filing fees for presentation of extra claims under 37 CFR 1.16 and any patent application processing fees under 37 CFR 1.17 or credit any overpayment to Mendelsohn, Drucker, & Associates, P.C. Deposit Account No. 50-0782.

The Commissioner for Patents is hereby authorized to treat any concurrent or future reply, requiring a petition for extension of time under 37 CFR § 1.136 for its timely submission, as incorporating a petition for extension of time for the appropriate length of time if not submitted with the reply.

Respectfully submitted,

Date: February 13, 2012

/Kevin M. Drucker/

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Philadelphia, Pennsylvania 19102

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NOTICE OF ALLOWANCE AND FEE(S) DUE

46900 7590 02/23/2012
MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 405
PHILADELPHIA, PA 19102

EXAMINER	
WANG-HURST, KATHY W	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 02/23/2012

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11-N-USA	7512

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1740	$300	$0	$2040	05/23/2012

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
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or Fax (571)-273-2885

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

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

46900 7590 02/23/2012
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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.

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11-N-USA	7512

TITLE OF INVENTION: SYSTEM AND METHOD FOR CONSERVING BATTERY POWER IN A MOBILE STATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1740	$300	$0	$2040	05/23/2012

EXAMINER	ART UNIT	CLASS-SUBCLASS
WANG-HURST, KATHY W	2617	455-574000

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

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

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

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

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

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

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number ____ (enclose an extra copy of this form).

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

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.
11/945,505	11/27/2007	Norman Goris	GORIS 11-11-N-USA	7512

46900 7590 02/23/2012
MENDELSOHN, DRUCKER, & ASSOCIATES, P.C.
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PHILADELPHIA, PA 19102

EXAMINER	
WANG-HURST, KATHY W	
ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 02/23/2012

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 455 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 455 day(s).

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

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

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

Notice of Allowability	Application No. 11/945,505	Applicant(s) GORIS ET AL.	
	Examiner KATHY WANG-HURST	Art Unit 2617	

-- 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 *2/13/2012*.

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

3. ☒ The allowed claim(s) is/are *1-14*.

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/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/KATHY WANG-HURST/ Examiner, Art Unit 2617	/KAMRAN AFSHAR/ Supervisory Patent Examiner, Art Unit 2617

DETAILED ACTION

Allowable Subject Matter

1. In view of the filed Terminal Disclaimer and further searches, claims 1-14 are allowed.

2. The following is an examiner's statement of reasons for allowance: claims 1-14 are allowed for the reasons as set forth in applicant's response filed on 2/13/2012.

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

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATHY WANG-HURST whose telephone number is (571)270-5371. The examiner can normally be reached on Monday-Thursday, 7:30am-5pm, alternate Fridays, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamran Afshar can be reached on (571) 272-7796. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/KATHY WANG-HURST/
Examiner, Art Unit 2617

/KAMRAN AFSHAR/

Supervisory Patent Examiner, Art Unit 2617

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
11/945,505	27 November, 2007	GORIS ET AL.	GORIS 11-11-N-USA

		EXAMINER	
MENDELSOHN, DRUCKER, & ASSOCIATES, P.C. 1500 JOHN F. KENNEDY BLVD., SUITE 405 PHILADELPHIA, PA 19102		KATHY WANG-HURST	
		ART UNIT	PAPER
		2617	20120510

DATE MAILED:

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

Commissioner for Patents

After carefully reviewing IDS submitted by the applicant on 5/8/2012, the examiner maintains the previous allowance for the following reasons: none of the prior art cited in DE 10 2004 028 259.5 teaches the limitation of activiating the proximity sensor only after a second condition is satisfied with the second condition being that a user of the mobile station has performed an action to initiate an outgoing call or to answer an incoming call. Specifically, prior art document 1) US 6246862 discloses IR transmission element of the IR proximity detector is always on as it "is set to a narrow IR transmission angle and a very low avearge power level to localize the IR transmission beam to a sensing region…"(see col. 3, line 33-col. 4 line 9). Prior art document 2) US 2002/0084998 discloses the distance sensor is activated automatically upon turning on the power of the radio communication apparatus (see [0034]). Prior art document 3) US 5881377 discloses a blanking maintenace routine is performed periodically such as every 30 ms wherein the earpiece sensor is activated as part of the blanking maintenance routine and thus activated periodically such as every 30ms. (col. 6, lines 39-57). Therefore none of the prior art sufficiently teaches all the limitations of current application and thus allowance is maintained.

/KATHY WANG-HURST/
Examiner, Art Unit 2617

PTO-90C (Rev.04-03)

EXHIBIT E

U 7689668

THE UNITED STATES OF AMERICA

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United States Patent and Trademark Office

August 14, 2018

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF:

U.S. PATENT: *7,990,842*
ISSUE DATE: *August 02, 2011*

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

JOHN A BURSON
Certifying Officer

US007990842B2

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

(10) **Patent No.: US 7,990,842 B2**
(45) **Date of Patent: *Aug. 2, 2011**

(54) **BACKWARD-COMPATIBLE LONG TRAINING SEQUENCES FOR WIRELESS COMMUNICATION NETWORKS**

(75) Inventors: **Jason Alexander Trachewsky**, Menlo Park, CA (US); **Rajendra T. Moorti**, Mountain View, CA (US)

(73) Assignee: **Broadcom Corporation**, Irvine, CA (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/684,650**

(22) Filed: **Jan. 8, 2010**

(65) **Prior Publication Data**

US 2010/0110876 A1 May 6, 2010

Related U.S. Application Data

(63) Continuation of application No. 11/188,771, filed on Jul. 26, 2005, now Pat. No. 7,646,703.

(60) Provisional application No. 60/591,104, filed on Jul. 27, 2004, provisional application No. 60/634,102, filed on Dec. 8, 2004.

(51) **Int. Cl.**
H04J 11/00 (2006.01)

(52) **U.S. Cl.** **370/208**; 370/210

(58) **Field of Classification Search** 370/208, 370/210

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

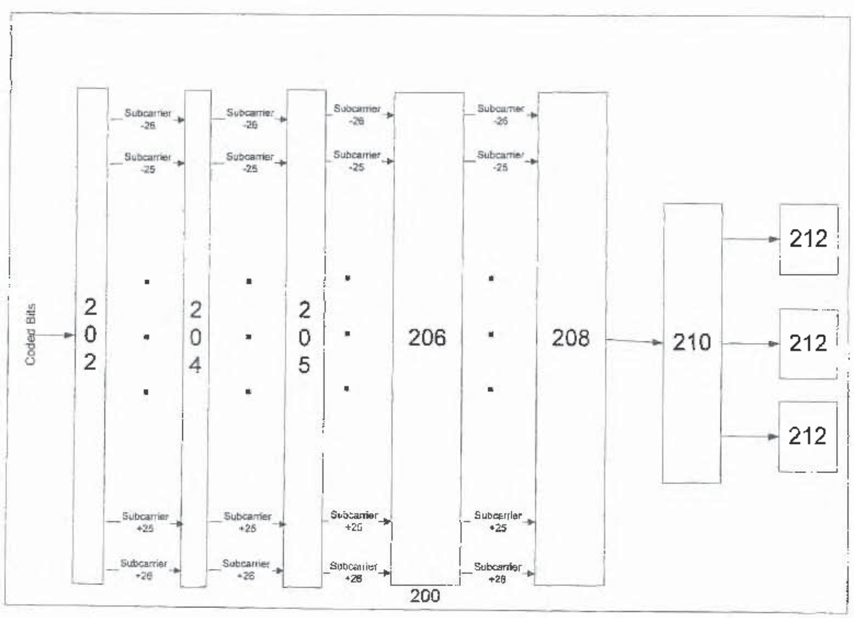
7,203,245	B1	4/2007	Murphy
7,254,171	B2	8/2007	Hudson
7,394,865	B2	7/2008	Borran et al.
2004/0008803	A1	1/2004	Aldrovandi et al.
2004/0264585	A1	12/2004	Borran et al.
2005/0265219	A1	12/2005	Murphy et al.
2006/0209890	A1	9/2006	MacMullan et al.
2006/0209892	A1	9/2006	MacMullan et al.
2007/0002749	A1	1/2007	Sondur et al.
2007/0047671	A1	3/2007	Chen

Primary Examiner — Andrew Lee
(74) *Attorney, Agent, or Firm* — McAndrews, Held & Malloy, Ltd.

(57) **ABSTRACT**

A network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 52 sub-carriers.

20 Claims, 5 Drawing Sheets



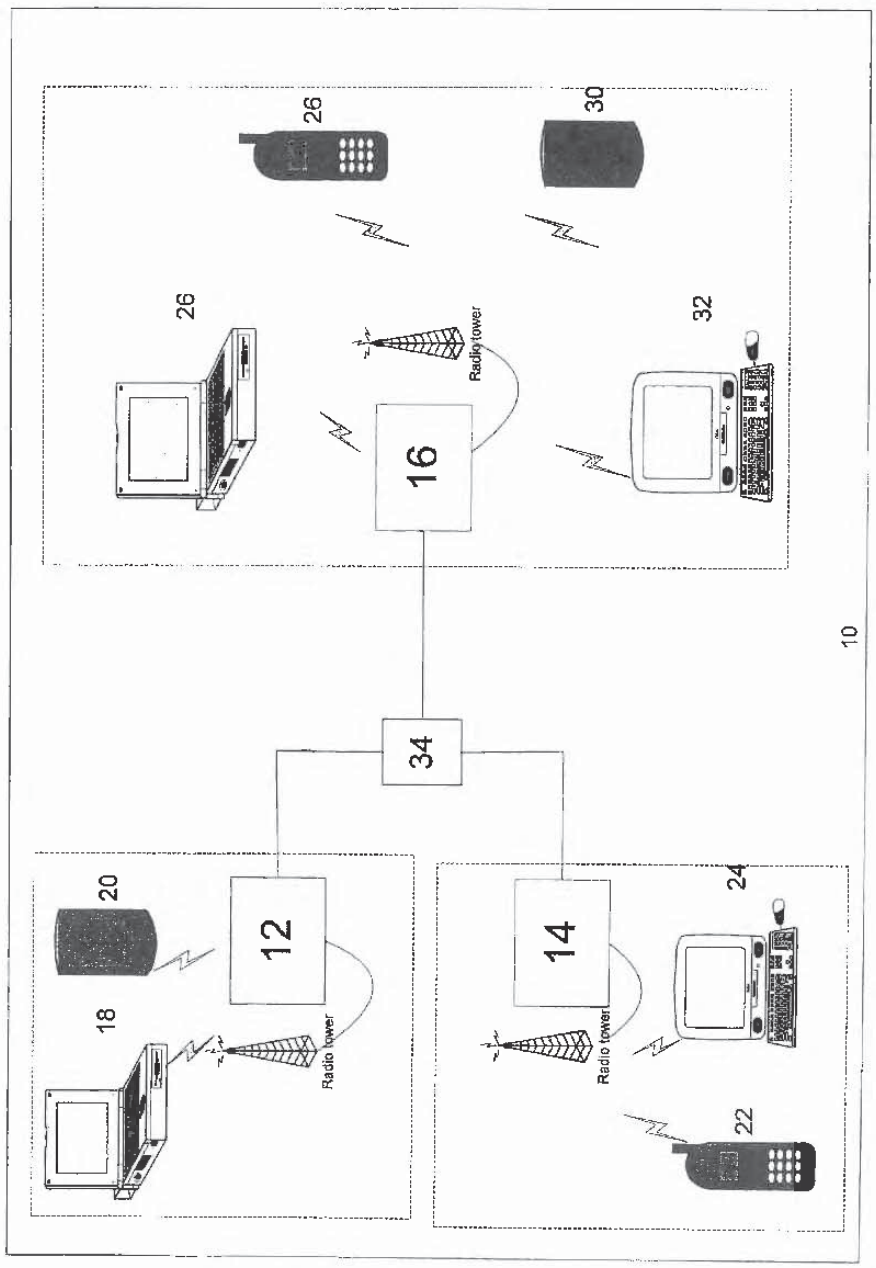

26
30
26
Radio tower
16
32
10
34
20
12
18
Radio tower
14
24
Radio tower
22

Figure 1

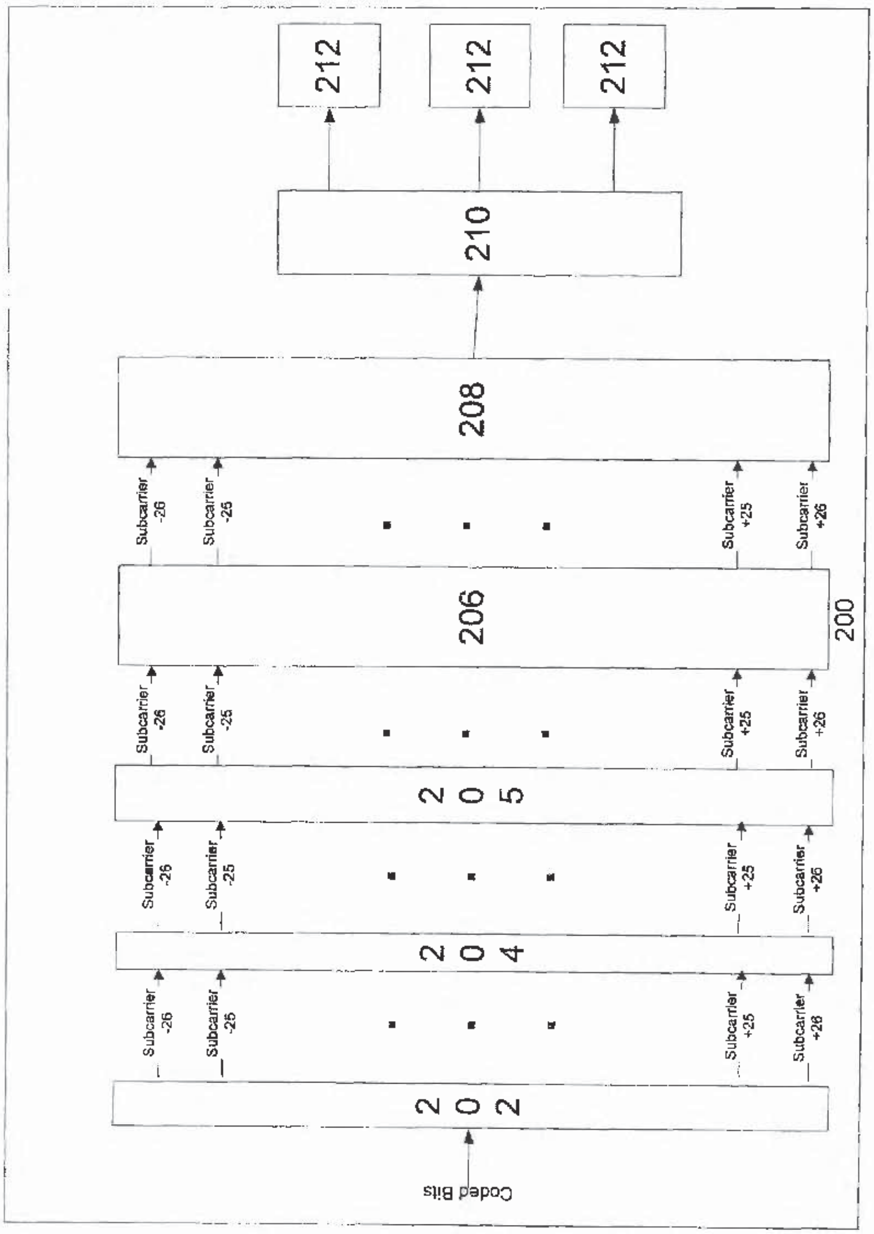

Coded Bits
202
204
205
206
208
210
212
212
212
200
Subcarrier -26
Subcarrier -25
Subcarrier +25
Subcarrier +26

Figure 2

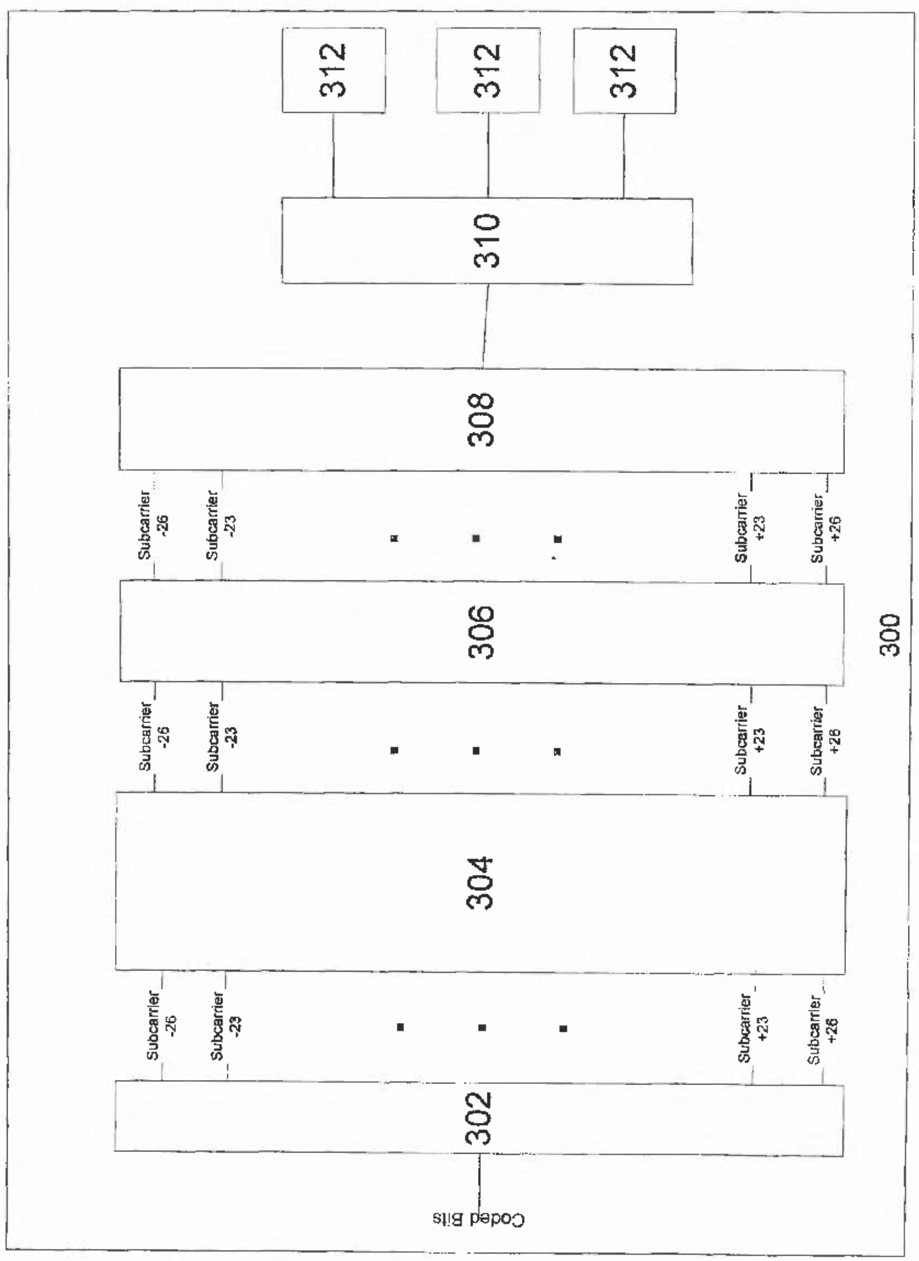

312
312
312
310
308
Subcarrier -26
Subcarrier -23
Subcarrier +23
Subcarrier +26
306
300
Subcarrier -26
Subcarrier -23
Subcarrier +23
Subcarrier +26
304
Subcarrier -26
Subcarrier -23
Subcarrier +23
Subcarrier +26
302
Coded Bits

Figure 3

+1	+1	1	1	-1	-1	1	1	-1	1	-1	1	1	1
-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15

Sub-carrier index

1	1	1	-1	-1	1	1	-1	1	-1	1	1	1	1	0
-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0

Sub-carrier index

+1	-1	-1	1	1	-1	1	-1	1	-1	-1	-1	-1	-1
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Sub-carrier index

1	1	-1	-1	1	-1	1	-1	1	1	1	1	-1	-1
15	16	17	18	19	20	21	22	23	24	25	26	27	28

Sub-carrier index

LONG TRAINING SEQUENCE FOR 56 ACTIVE
FIGURE 4

-1	-1	+1	+1	+1	+1	1	1	-1	-1	1	1	-1	1	-1	1	1	1
-32	-31	-30	-29	-28	-27	-26	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15

Sub-carrier index

1	1	1	-1	-1	1	1	-1	1	-1	1	1	1	1	0
-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0

Sub-carrier index

+1	-1	-1	1	1	-1	1	-1	1	-1	-1	-1	-1	-1
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Sub-carrier index

1	1	-1	-1	1	-1	1	-1	1	1	1	1	-1	-1	-1	+1	-1
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Sub-carrier index

LONG TRAINING SEQUENCE FOR 63 ACTIVE
FIGURE 5

BACKWARD-COMPATIBLE LONG TRAINING SEQUENCES FOR WIRELESS COMMUNICATION NETWORKS

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a CONTINUATION of U.S. application Ser. No. 11/188,771, filed Jul. 26, 2005. Said U.S. application Ser. No. 11/188,771 makes reference to, claims priority to and claims benefit from U.S. Application No. 60/591,104, filed Jul. 27, 2004; and U.S. Application No. 60/634,102, filed Dec. 8, 2004. The above-identified applications are hereby incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to wireless communication systems and more particularly to long training sequences of minimum peak-to-average power ratio which may be used by legacy systems.

2. Description of the Related Art

Each wireless communication device participating in wireless communications includes a built-in radio transceiver (i.e., receiver and transmitter) or is coupled to an associated radio transceiver. As is known to those skilled in the art, the transmitter typically includes a data modulation stage, one or more intermediate frequency stages, and a power amplifier. The data modulation stage converts raw data into baseband signals in accordance with a particular wireless communication standard. The intermediate frequency stages mix the baseband signals with one or more local oscillations to produce RF signals. The power amplifier amplifies the RF signals prior to transmission via an antenna.

The receiver is typically coupled to the antenna and includes a low noise amplifier, one or more intermediate frequency stages, a filtering stage, and a data recovery stage. The low noise amplifier receives, via the antenna, inbound RF signals and amplifies the inbound RF signals. The intermediate frequency stages mix the amplified RF signals with one or more local oscillations to convert the amplified RF signal into baseband signals or intermediate frequency (IF) signals. The filtering stage filters the baseband signals or the IF signals to attenuate unwanted out of band signals to produce filtered signals. The data recovery stage recovers raw data from the filtered signals in accordance with a particular wireless communication standard.

Different wireless devices in a wireless communication system may be compliant with different standards or different variations of the same standard. For example, 802.11a an extension of the 802.11 standard, provides up to 54 Mbps in the 5 GHz band. 802.11b, another extension of the 802.11 standard, provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11g, another extension of the 802.11 standard, provides 20+ Mbps in the 2.4 GHz band. 802.11n, a new extension of 802.11, is being developed to address, among other thins, higher throughput and compatibility issues. An 802.11a compliant communications device may reside in the same WLAN as a device that is compliant with another 802.11 standard. When devices that are compliant with multiple versions of the 802.11 standard are in the same WLAN, the devices that are compliant with older versions are considered to be legacy devices. To ensure backward compatibility with legacy devices, specific mechanisms must be employed to insure that the legacy devices

know when a device that is compliant with a newer version of the standard is using a wireless channel to avoid a collision. New implementations of wireless communication protocol enable higher speed throughput, while also enabling legacy devices which might be only compliant with 802.11a or 802.11g to communicate in systems which are operating at higher speeds.

Devices implementing both the 802.11a and 802.11g standards use an orthogonal frequency division multiplexing (OFDM) encoding scheme. OFDM is a frequency division multiplexing modulation technique for transmitting large amounts of digital data over a radio wave. OFDM works by spreading a single data stream over a band of sub-carriers, each of which is transmitted in parallel. In 802.11a and 802.11g compliant devices, only 52 of the 64 active sub-carriers are used. Four of the active sub-carriers are pilot sub-carriers that the system uses as a reference to disregard frequency or phase shifts of the signal during transmission. The remaining 48 sub-carriers provide separate wireless pathways for sending information in a parallel fashion. The 52 sub-carriers are modulated using binary or quadrature phase shift keying (BPSK/QPSK), 16 Quadrature Amplitude Modulation (QAM), or 64 QAM. Therefore, 802.11a and 802.11g compliant devices use sub-carriers −26 to +26, with the 0-index sub-carrier set to 0 and 0-index sub-carrier being the carrier frequency. As such, only part of the 20 Mhz bandwidth supported by 802.11a and 802.11g is use.

In 802.11a/802.11g, each data packet starts with a preamble which includes a short training sequence followed by a long training sequence. The short and long training sequences are used for synchronization between the sender and the receiver. The long training sequence of 802.11a and 802.11g is defined such that each of sub-carriers −26 to +26 has one BPSK consellation point, either +1 or −1.

There exists a need to create a long training sequence of minimum peak-to-average ratio that uses more sub-carriers without interfering with adjacent channels. The inventive long trains sequence with a minimum peak-to-average power ratio should be usable by legacy devices in order to estimate channel impulse response and to estimate carrier frequency offset between a transmitter and a receiver.

SUMMARY OF THE INVENTION

According to one aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 52 sub-carriers.

According to another aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 56 sub-carriers.

According to another aspect of the invention, there is provided a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. The network device includes a signal generating circuit for generating the expanded long training sequence. The network device also includes an Inverse Fourier Transform for processing the expanded long training sequence from the signal generating circuit and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The expanded long training sequence and the optimal expanded long training sequence are stored on more than 63 sub-carriers.

According to another aspect of the invention, there is provided a method for generating an expanded long training sequence with a minimal peak-to-average ratio. The method includes the steps of generating the expanded long training sequence and producing an optimal expanded long training sequence with a minimal peak-to-average ratio. The method also includes the step of storing the expanded long training sequence and the optimal expanded long training sequence on more than 52 sub-carriers.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention that together with the description serve to explain the principles of the invention, wherein:

FIG. **1** illustrates a communication system that includes a plurality of base stations, a plurality of wireless communication devices and a network hardware component;

FIG. **2** illustrates a schematic block diagram of a processor that is configured to generate an expanded long training sequence;

FIG. **3** is a schematic block diagram of a processor that is configured to process an expanded long training sequence;

FIG. **4** illustrates the long training sequence that is used in 56 active sub-carriers; and

FIG. **5** illustrates the long training sequence that is used in 63 active sub-carriers.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

FIG. **1** illustrates a communication system **10** that includes a plurality of base stations and/or access points **12-16**, a plurality of wireless communication devices **18-32** and a network hardware component **34**. Wireless communication devices **18-32** may be laptop computers **18** and **26**, personal digital assistant hosts **20** and **30**, personal computer **24** and **32** and/or cellular telephone **22** and **28**. Base stations or access points **12-16** are operably coupled to network hardware **34** via local area network connections **36**, **38** and **40**. Network hardware **34**, for example a router, a switch, a bridge, a modem, or a system controller, provides a wide area network connection for communication system **10**. Each of base stations or access points **12-16** has an associated antenna or antenna array to communicate with the wireless communication devices in its area. Typically, the wireless communication devices register with a particular base station or access point **12-14** to receive services from communication system **10**. Each wireless communication device includes a built-in radio or is coupled to an associated radio. The radio includes at least one radio frequency (RF) transmitter and at least one RF receiver.

The present invention provides an expanded long training sequence of minimum peak-to-average power ratio and thereby decreases power back-off. The inventive expanded long training sequence may be used by 802.11a or 802.11g devices for estimating the channel impulse response and by a receiver for estimating the carrier frequency offset between the transmitter clock and receiver clock. The inventive expanded long training sequence is usable by 802.11a or 802.11g systems only if the values at sub-carriers −26 to +26 are identical to those of the current long training sequence used in 802.11a and 802.11g systems. As such, the invention utilized the same +1 or −1 binary phase shift key (BPSK) encoding for each new sub-carrier and the long training sequence of 802.11a or 802.11g systems is maintained in the present invention.

In a first embodiment of the invention, the expanded long training sequence is implemented in 56 active sub-carriers including sub-carriers −28 to +28. In another embodiment, an expanded long training sequence is implemented using 63 active sub-carriers, i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. In both embodiments of the invention, orthogonality is not affected, since a 64-point orthogonal transform is used to generate the time-domain sequence. Additionally, the output of an auto-correlator for computing the carrier frequency offset is not affected by the extra sub-carriers.

FIG. **2** illustrates a schematic block diagram of a processor that is configured to generate an expanded long training sequence. Processor **200** includes a symbol mapper **202**, a frequency domain window **204**, a signal generating circuit **205**, an inverse fast Fourier transform (IFFT) module **206**, a serial to parallel module **208**, a digital transmit filter and/or time domain window module **210**, and digital to analog converters (D/A) **212**. For an expanded long training sequence, symbol mapper **202** generates symbols from the coded bits for each of the 64 subcarriers of an OFDM sequence. Frequency domain window **204** applies a weighting factor on each subcarrier. Signal generating circuit **205** generates the expanded long training sequence and if 56 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −28 to +28. If 63 active sub-carriers are being used, signal generating circuit generates the expanded long training sequence and stores the expanded long training sequence in sub-carriers −32 to +32 i.e., all of the active sub-carriers (−32 to +31) except the 0-index sub-carrier which is set to 0. The inventive long training sequence is inputted into an Inverse Fourier Transform **206**. The invention uses the same +1 or −1 BPSK encoding for each new sub-carrier. Inverse Fourier Transform **206** may be an inverse Fast Fourier Transform (IFFT) or Inverse Discrete Fourier Transform (IFDT). Inverse Fourier Transform **206** processes the long training sequence from signal generating circuit **205** and thereafter produces an optimal expanded long training sequence with a minimal peak-to-average power ratio. The optimal expanded long training sequence may be used in either 56 active sub-carriers or 63 active subscribers. Serial to parallel module **208** converts the serial time domain signals into parallel time domain signals that are subsequently filtered and converted to analog signals via the D/A.

FIG. **3** is a schematic block diagram of a processor that is configured to process an expanded long training sequence. Processor **300** includes a symbol demapper **302**, a frequency domain window 304, a fast Fourier transform (FFT) module 306, a parallel to serial module 308, a digital receiver filter and/or time domain window module 310, and analog to digital converters (A/D) 312. A/D converters 312 convert the sequence into digital signals that are filtered via digital receiver filter 310. Parallel to serial module 308 converts the digital time domain signals into a plurality of serial time domain signals. FFT module 306 converts the serial time domain signals into frequency domain signals. Frequency domain window 304 applies a weighting factor on each frequency domain signal. Symbol demapper 302 generates the coded bits from each of the 64 subcarriers of an OFDM sequence received from the frequency domain window.

FIG. 4 illustrates the long training sequence with a minimum peak-to-average power ratio that is used in 56 active sub-carriers. Out of the 16 possibilities for the four new sub-carrier positions, the sequence illustrated in FIG. 4 has the minimum peak-to-average power ratio, i.e., a peak-to-average power ratio of 3.6 dB.

FIG. 5 illustrates the long training sequence with a minimum peak-to-average power ratio that is used in 63 active sub-carriers. Out of the 2048 possibilities for the eleven new sub-carrier positions, the sequence illustrated in FIG. 5 has the minimum peak-to-average power ratio, i.e., a peak-to-average power ratio of 3.6 dB.

It should be appreciated by one skilled in art, that the present invention may be utilized in any device that implements the OFDM encoding scheme. The foregoing description has been directed to specific embodiments of this invention. It will be apparent, however, that other variations and modifications may be made to the described embodiments, with the attainment of some or all of their advantages. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true spirit and scope of the invention.

What is claimed:

1. A wireless communications device, comprising:

a signal generator that generates an extended long training sequence; and

an Inverse Fourier Transformer operatively coupled to the signal generator,

wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides an optimal extended long training sequence with a minimal peak-to-average ratio, and

wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme.

2. The wireless communications device according to claim 1, wherein at least the optimal extended long training sequence is carried by at least 56 active sub-carriers.

3. The wireless communications device according to claim 2, wherein the at least 56 active sub-carriers correspond to at least indexed sub-carriers −28 to +28.

4. The wireless communications device according to claim 2, wherein the optimal extended long training sequence has a minimum peak-to-average power ratio of 3.6 dB.

5. The wireless communications device according to claim 1, wherein at least the optimal extended long training sequence is carried by at least 63 active sub-carriers.

6. The wireless communications device according to claim 5, wherein the at least 63 active sub-carriers correspond to at least indexed sub-carriers −32 to +31.

7. The wireless communications device according to claim 5, wherein the optimal extended long training sequence has a minimum peak-to-average power ratio of 3.6 dB.

8. The wireless communications device according to claim 1, wherein a binary phase shift key encoding is used for each sub-carrier above the +26 indexed sub-carrier and below the −26 indexed sub-carrier.

9. The wireless communications device according to claim 1, wherein the Inverse Fourier Transformer comprises at least one of the following: an Inverse Fast Fourier Transformer and an Inverse Discrete Fourier Transformer.

10. The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer and a cellular phone.

11. The wireless communications device according to claim 1, wherein the wireless communications device comprises a wireless mobile communications device.

12. The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: an access point and a base station.

13. The wireless communications device according to claim 1, wherein the wireless communications device is backwards compatible with legacy wireless local area network devices.

14. The wireless communications device according to claim 1, wherein the optimal extended long training sequence is longer than a long training sequence used by a legacy wireless local area network device in accordance with a legacy wireless networking protocol standard.

15. The wireless communications device according to claim 14, wherein the legacy wireless local area network device uses the optimal extended long training sequence to estimate a carrier frequency offset even though the optimal extended long training sequence is longer than the long training sequence that is specified by the legacy wireless networking protocol standard.

16. The wireless communications device according to claim 15, wherein the long training sequence that is specified by the legacy wireless networking protocol standard is maintained in the extended long training sequence or the optimal extended long training sequence.

17. The wireless communications device according to claim 1, wherein the wireless communications device decreases power back-off.

18. The wireless communications device according to claim 1, wherein the wireless communications device registers with one or more of the following: an access point and a base station.

19. The wireless communications device according to claim 1, wherein the extended long training sequence or the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the subcarriers.

20. The wireless communications device according to claim 1, comprising:

a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.

* * * * *

EXHIBIT F

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August 23, 2018

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF:

U.S. PATENT: *8,416,862*
ISSUE DATE: *April 09, 2013*

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

SYLVIA HOLLEY
Certifying Officer

US008416862B2

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

(10) **Patent No.:** **US 8,416,862 B2**
(45) **Date of Patent:** **Apr. 9, 2013**

(54) **EFFICIENT FEEDBACK OF CHANNEL INFORMATION IN A CLOSED LOOP BEAMFORMING WIRELESS COMMUNICATION SYSTEM**

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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 2247 days.

(21) Appl. No.: **11/237,341**

(22) Filed: **Sep. 28, 2005**

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 11/168,793, filed on Jun. 28, 2005.

(60) Provisional application No. 60/673,451, filed on Apr. 21, 2005, provisional application No. 60/698,686, filed on Jul. 13, 2005.

(51) **Int. Cl.**
H04K 1/10 (2006.01)

(52) **U.S. Cl.** **375/260**; 375/267; 375/350

(58) **Field of Classification Search** 375/267
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,541,607 A * 7/1996 Reinhardt 342/372
2002/0187753 A1 * 12/2002 Kim et al. 455/69
2003/0139196 A1 * 7/2003 Medvedev et al. 455/522
2004/0042558 A1 * 3/2004 Hwang et al. 375/267
2005/0286663 A1 * 12/2005 Poon 375/347

OTHER PUBLICATIONS

A unified algebraic transformation approach for parallel recursive and adaptive filtering and SVD algorithms Jun Ma; Parhi, K.K.; Deprettere, E.F.; Signal Processing, IEEE Transactions on [see also Acoustics, Speech, and Signal Processing, IEEE Transactions on] vol. 49, Issue 2, Feb. 2001 pp. 424-437.*

* cited by examiner

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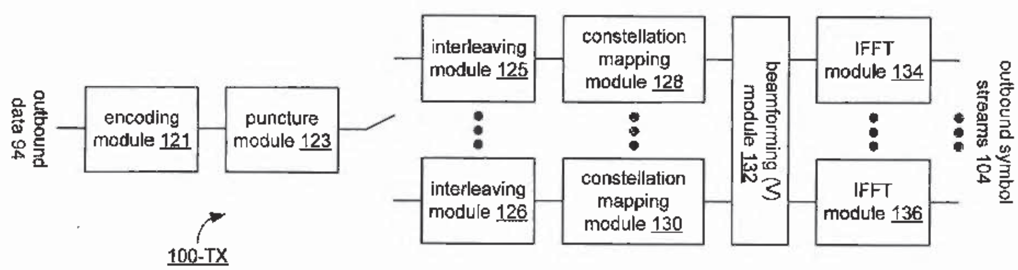
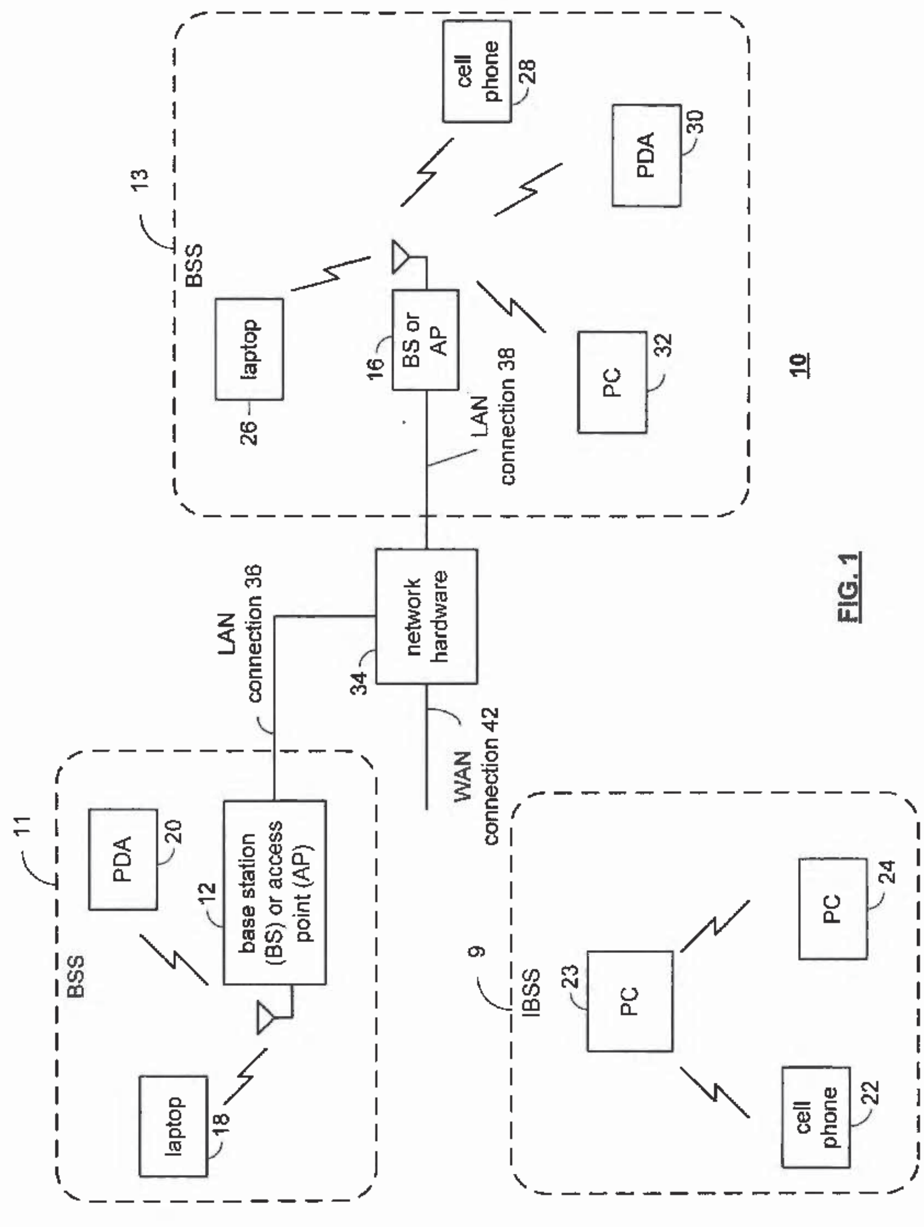
Assistant Examiner — Michael Neff
(74) *Attorney, Agent, or Firm* — Garlick & Markison; Holly L. Rudnick

(57) **ABSTRACT**

A method for feeding back transmitter beamforming information from a receiving wireless communication device to a transmitting wireless communication device includes a receiving wireless communication device receiving a preamble sequence from the transmitting wireless device. The receiving wireless device estimates a channel response based upon the preamble sequence and then determines an estimated transmitter beamforming unitary matrix based upon the channel response and a receiver beamforming unitary matrix. The receiving wireless device then decomposes the estimated transmitter beamforming unitary matrix to produce the transmitter beamforming information and then wirelessly sends the transmitter beamforming information to the transmitting wireless device. The receiving wireless device may transform the estimated transmitter beamforming unitary matrix using a QR decomposition operation such as a Givens Rotation operation to produce the transformer beamforming information.

20 Claims, 8 Drawing Sheets

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PDA
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PC
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LAN connection 38
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network hardware
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WAN connection 42
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BSS
PDA
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laptop
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IBSS
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PC
PC
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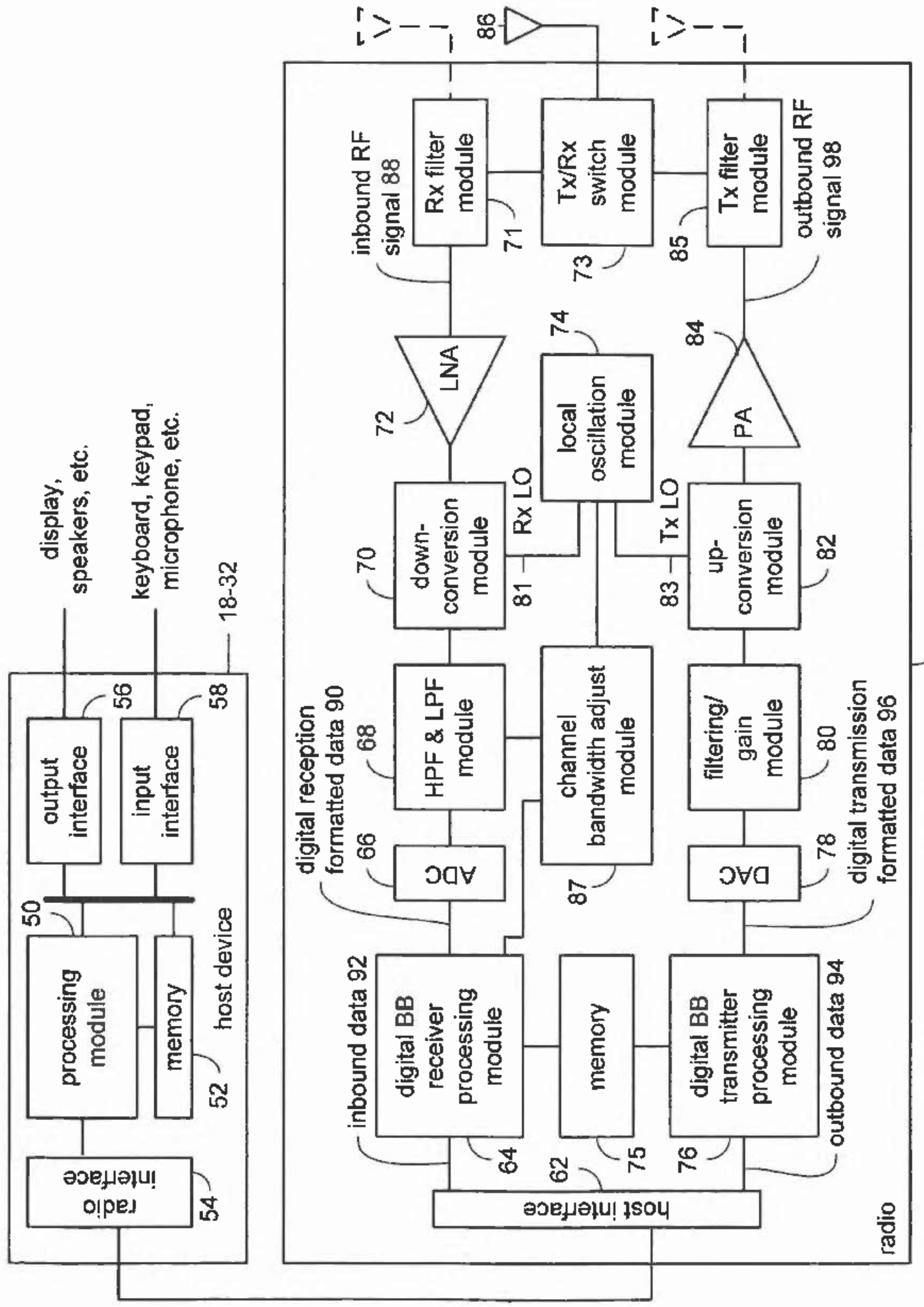
cell phone
22

FIG. 1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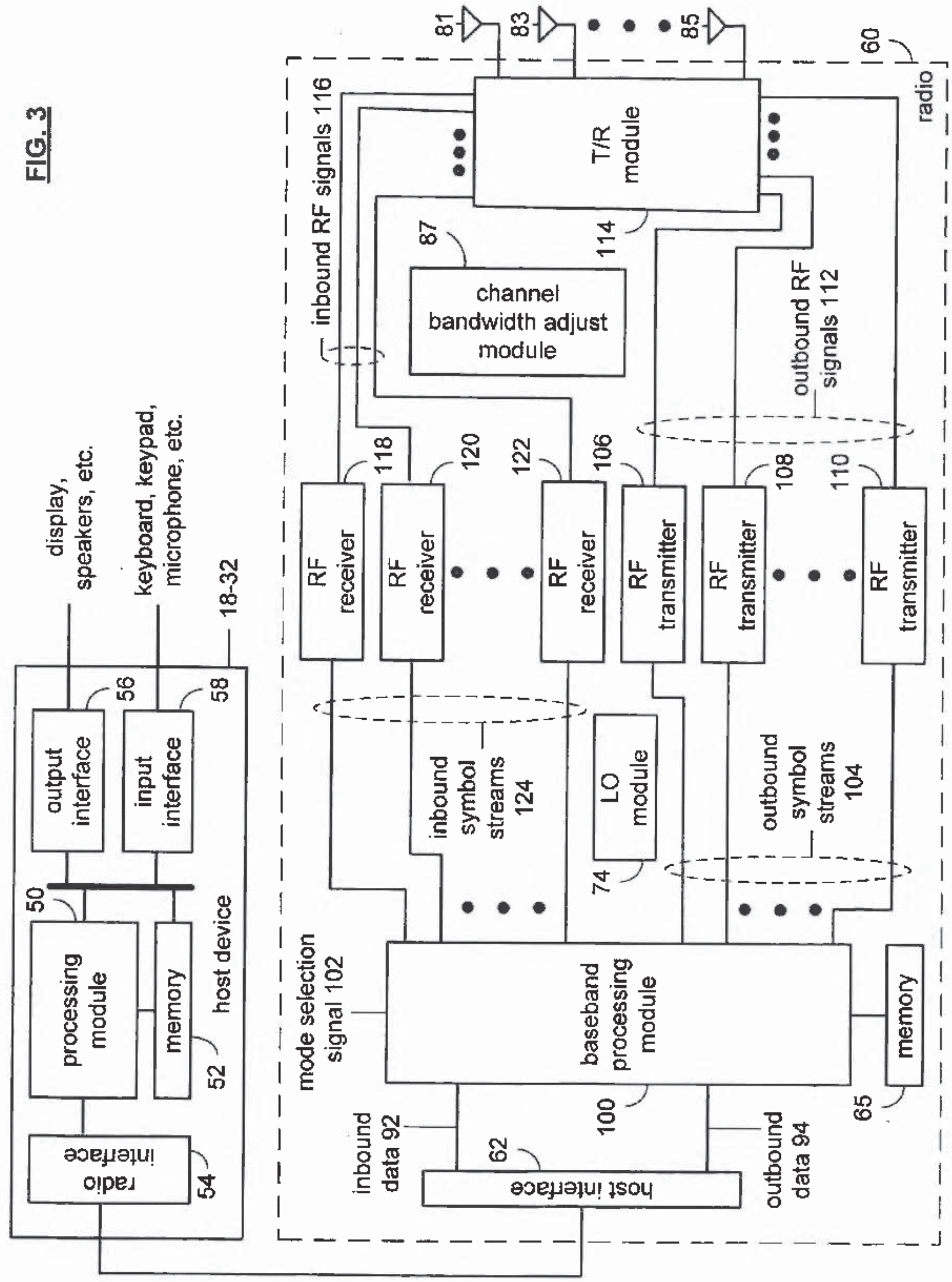
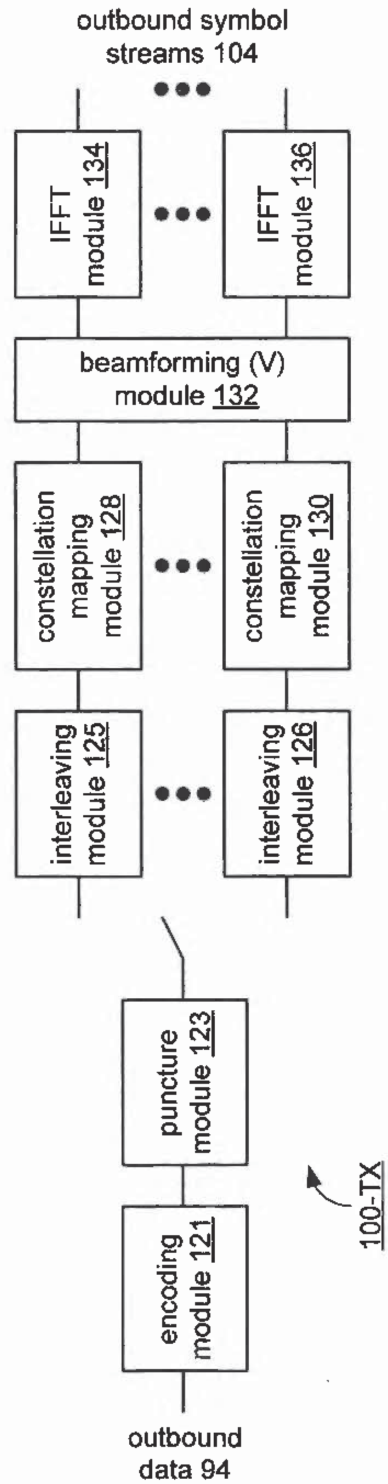
keyboard, keypad, microphone, etc.
18-32
output interface
56
input interface
58
50
processing module
memory
52
host device
radio interface
54
inbound RF signal 88
Rx filter module
71
Tx/Rx switch module
73
86
Tx filter module
85
outbound RF signal 98
LNA
72
74
local oscillation module
84
PA
down-conversion module
70
Rx LO
81
Tx LO
83
up-conversion module
82
digital reception formatted data 90
HPF & LPF module
68
ADC
66
channel bandwidth adjust module
87
filtering/gain module
80
DAC
78
digital transmission formatted data 96
60
inbound data 92
digital BB receiver processing module
64
memory
75
digital BB transmitter processing module
76
outbound data 94
62
host interface
radio

FIG. 2

FIG. 3



display, speakers, etc.
keyboard, keypad, microphone, etc.
18-32
output interface
56
input interface
58
50
processing module
memory
52
host device
radio interface
54
mode selection signal 102
inbound data 92
62
host interface
100
outbound data 94
baseband processing module
memory
65
inbound symbol streams 124
LO module
74
outbound symbol streams 104
RF receiver
118
RF receiver
120
RF receiver
122
RF transmitter
106
RF transmitter
108
RF transmitter
110
inbound RF signals 116
channel bandwidth adjust module
87
114
T/R module
outbound RF signals 112
81
83
85
60
radio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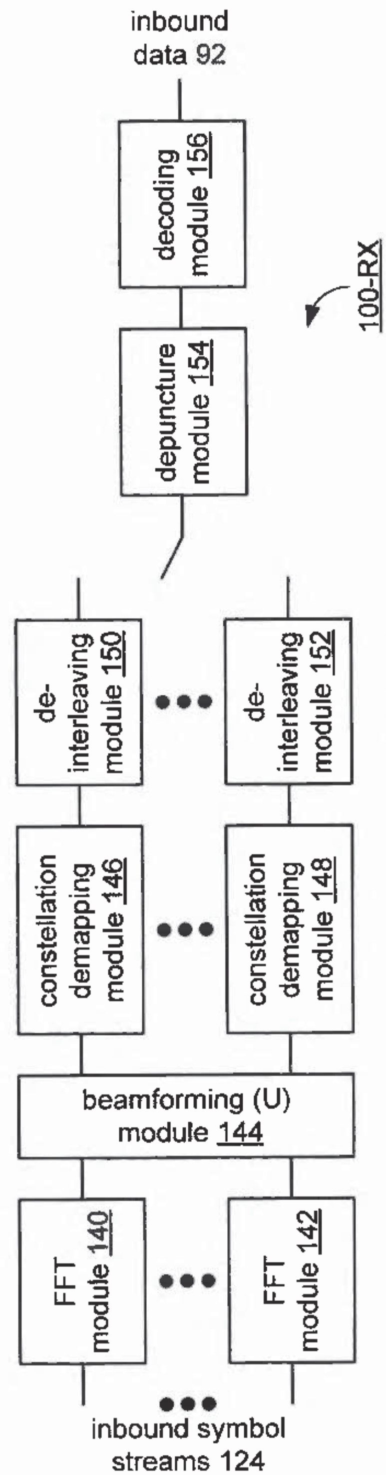
IFFT module 134
IFFT module 136
beamforming (V) module 132
constellation mapping module 128
constellation mapping module 130
interleaving module 125
interleaving module 126
puncture module 123
encoding module 121
100-TX
outbound data 94

FIG. 4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decoding module 156
depuncture module 154
100-RX
de-interleaving module 150
de-interleaving module 152
constellation demapping module 146
constellation demapping module 148
beamforming (U) module 144
FFT module 140
FFT module 142
inbound symbol streams 124

FIG. 5

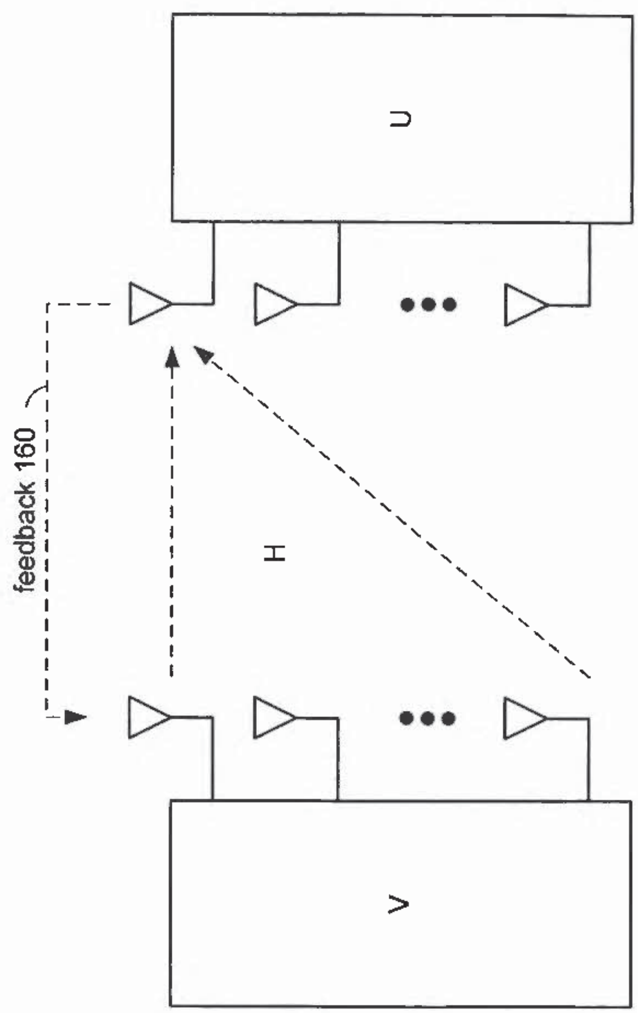

FIG. 6

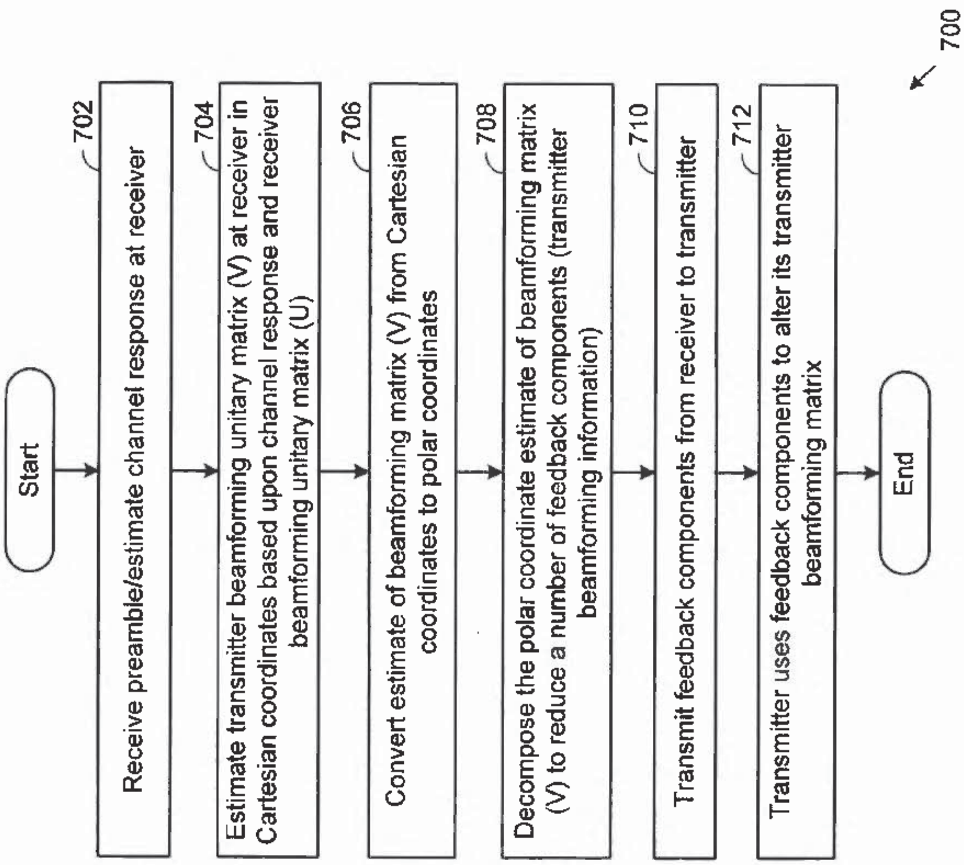
Start
702
Receive preamble/estimate channel response at receiver
704
Estimate transmitter beamforming unitary matrix (V) at receiver in Cartesian coordinates based upon channel response and receiver beamforming unitary matrix (U)
706
Convert estimate of beamforming matrix (V) from Cartesian coordinates to polar coordinates
708
Decompose the polar coordinate estimate of beamforming matrix (V) to reduce a number of feedback components (transmitter beamforming information)
710
Transmit feedback components from receiver to transmitter
712
Transmitter uses feedback components to alter its transmitter beamforming matrix
End
700

FIG. 7

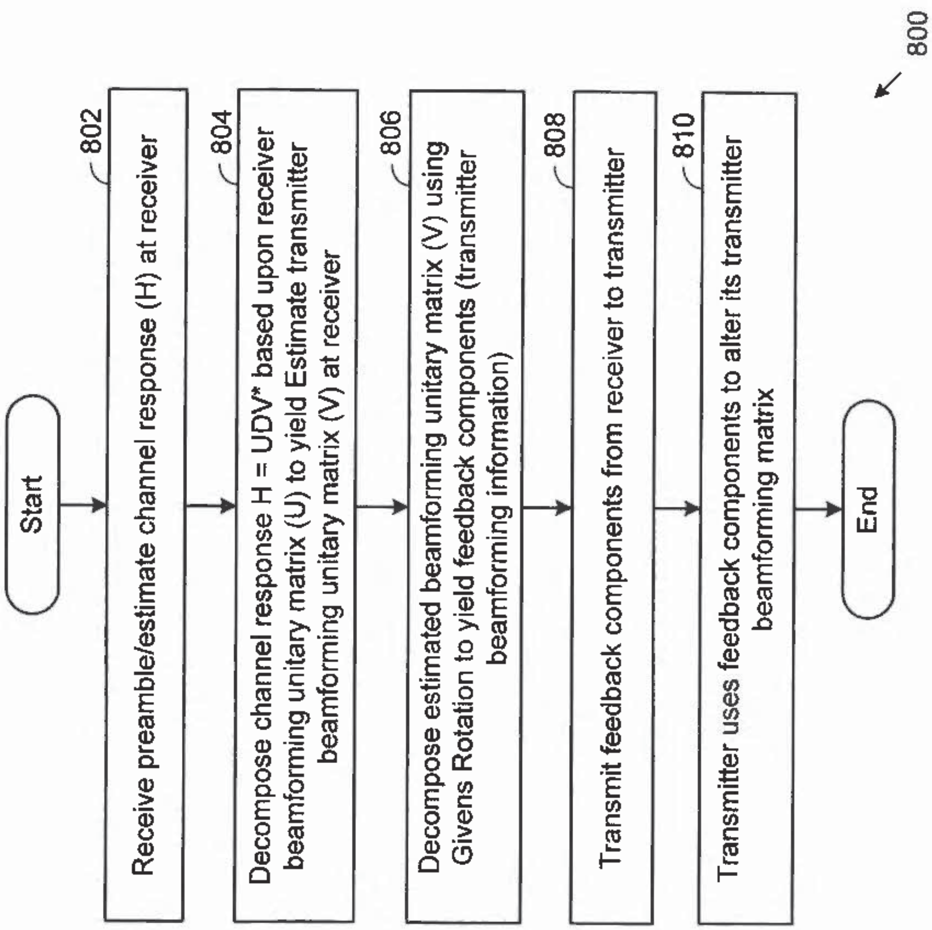
Start
802
Receive preamble/estimate channel response (H) at receiver
804
Decompose channel response H = UDV* based upon receiver beamforming unitary matrix (U) to yield Estimate transmitter beamforming unitary matrix (V) at receiver
806
Decompose estimated beamforming unitary matrix (V) using Givens Rotation to yield feedback components (transmitter beamforming information)
808
Transmit feedback components from receiver to transmitter
810
Transmitter uses feedback components to alter its transmitter beamforming matrix
End
800

FIG. 8

EFFICIENT FEEDBACK OF CHANNEL INFORMATION IN A CLOSED LOOP BEAMFORMING WIRELESS COMMUNICATION SYSTEM

CROSS REFERENCES TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. Utility application Ser. No. 11/168,793, filed Jun. 28, 2005 which claims priority to U.S. Provisional Patent Application Ser. No. 60/673,451, filed Apr. 21, 2005, and this application also claims priority to U.S. Provisional Patent Application Ser. No. 60/698,686, filed Jul. 13, 2005, all of which are incorporated herein by reference for all purposes.

BACKGROUND OF THE INVENTION

1. Technical Field of the Invention

This invention relates generally to wireless communication systems and more particularly to wireless communications using beamforming.

2. Description of Related Art

Communication systems are known to support wireless and wire lined communications between wireless and/or wire lined communication devices. Such communication systems range from national and/or international cellular telephone systems to the Internet to point-to-point in-home wireless networks. Each type of communication system is constructed, and hence operates, in accordance with one or more communication standards. For instance, wireless communication systems may operate in accordance with one or more standards including, but not limited to, IEEE 802.11, Bluetooth, advanced mobile phone services (AMPS), digital AMPS, global system for mobile communications (GSM), code division multiple access (CDMA), local multi-point distribution systems (LMDS), multi-channel-multi-point distribution systems (MMDS), and/or variations thereof.

Depending on the type of wireless communication system, a wireless communication device, such as a cellular telephone, two-way radio, personal digital assistant (PDA), personal computer (PC), laptop computer, home entertainment equipment, et cetera communicates directly or indirectly with other wireless communication devices. For direct communications (also known as point-to-point communications), the participating wireless communication devices tune their receivers and transmitters to the same channel or channels (e.g., one of the plurality of radio frequency (RF) carriers of the wireless communication system) and communicate over that channel(s). For indirect wireless communications, each wireless communication device communicates directly with an associated base station (e.g., for cellular services) and/or an associated access point (e.g., for an in-home or in-building wireless network) via an assigned channel. To complete a communication connection between the wireless communication devices, the associated base stations and/or associated access points communicate with each other directly, via a system controller, via the public switch telephone network, via the Internet, and/or via some other wide area network.

For each wireless communication device to participate in wireless communications, it includes a built-in radio transceiver (i.e., receiver and transmitter) or is coupled to an associated radio transceiver (e.g., a station for in-home and/or in-building wireless communication networks, RF modem, etc.). As is known, the receiver is coupled to the antenna and includes a low noise amplifier, one or more intermediate frequency stages, a filtering stage, and a data recovery stage.

The low noise amplifier receives inbound RF signals via the antenna and amplifies then. The one or more intermediate frequency stages mix the amplified RF signals with one or more local oscillations to convert the amplified RF signal into baseband signals or intermediate frequency (IF) signals. The filtering stage filters the baseband signals or the IF signals to attenuate unwanted out of band signals to produce filtered signals. The data recovery stage recovers raw data from the filtered signals in accordance with the particular wireless communication standard.

As is also known, the transmitter includes a data modulation stage, one or more intermediate frequency stages, and a power amplifier. The data modulation stage converts raw data into baseband signals in accordance with a particular wireless communication standard. The one or more intermediate frequency stages mix the baseband signals with one or more local oscillations to produce RF signals. The power amplifier amplifies the RF signals prior to transmission via an antenna.

In many systems, the transmitter will include one antenna for transmitting the RF signals, which are received by a single antenna, or multiple antennas, of a receiver. When the receiver includes two or more antennas, the receiver will select one of them to receive the incoming RF signals. In this instance, the wireless communication between the transmitter and receiver is a single-output-single-input (SISO) communication, even if the receiver includes multiple antennas that are used as diversity antennas (i.e., selecting one of them to receive the incoming RF signals). For SISO wireless communications, a transceiver includes one transmitter and one receiver. Currently, most wireless local area networks (WLAN) that are IEEE 802.11, 802.11a, 802,11b, or 802.11g employ SISO wireless communications.

Other types of wireless communications include single-input-multiple-output (SIMO), multiple-input-single-output (MISO), and multiple-input-multiple-output (MIMO). In a SIMO wireless communication, a single transmitter processes data into radio frequency signals that are transmitted to a receiver. The receiver includes two or more antennas and two or more receiver paths. Each of the antennas receives the RF signals and provides them to a corresponding receiver path (e.g., LNA, down conversion module, filters, and ADCs). Each of the receiver paths processes the received RF signals to produce digital signals, which are combined and then processed to recapture the transmitted data.

For a multiple-input-single-output (MISO) wireless communication, the transmitter includes two or more transmission paths (e.g., digital to analog converter, filters, up-conversion module, and a power amplifier) that each converts a corresponding portion of baseband signals into RF signals, which are transmitted via corresponding antennas to a receiver. The receiver includes a single receiver path that receives the multiple RF signals from the transmitter. In this instance, the receiver uses beam forming to combine the multiple RF signals into one signal for processing.

For a multiple-input-multiple-output (MIMO) wireless communication, the transmitter and receiver each include multiple paths. In such a communication. the transmitter parallel processes data using a spatial and time encoding function to produce two or more streams of data. The transmitter includes multiple transmission paths to convert each stream of data into multiple RF signals. The receiver receives the multiple RF signals via multiple receiver paths that recapture the streams of data utilizing a spatial and time decoding function. The recaptured streams of data are combined and subsequently processed to recover the original data.

To further improve wireless communications, transceivers may incorporate beamforming. In general, beamforming is a processing technique to create a focused antenna beam by shifting a signal in time or in phase to provide gain of the signal in a desired direction and to attenuate the signal in other directions. Prior art papers (1) Digital beamforming basics (antennas) by Steyskal, Hans, Journal of Electronic Defense, Jul. 1, 1996; (2) Utilizing Digital Down converters for Efficient Digital Beamforming, by Clint Schreiner, Red River Engineering, no publication date; and (3) Interpolation Based Transmit Beamforming for MIMO-OFMD with Partial Feedback, by Jihoon Choi and Robert W. Heath, University of Texas, Department of Electrical and Computer Engineering, Wireless Networking and Communications Group, Sep. 13, 2003 discuss beamforming concepts.

In order for a transmitter to properly implement beamforming (i.e., determine the beamforming matrix [V]), it needs to know properties of the channel over which the wireless communication is conveyed. Accordingly, the receiver must provide feedback information for the transmitter to determine the properties of the channel. One approach for sending feedback from the receiver to the transmitter is for the receiver to determine the channel response (H) and to provide it as the feedback information. An issue with this approach is the size of the feedback packet, which may be so large that, during the time it takes to send it to the transmitter, the response of the channel has changed.

To reduce the size of the feedback, the receiver may decompose the channel using singular value decomposition (SVD) and send information relating only to a calculated value of the transmitter's beamforming matrix (V) as the feedback information. In this approach, the receiver calculates (V) based on H=UDV*, where H is the channel response, D is a diagonal matrix, and U is a receiver unitary matrix. While this approach reduces the size of the feedback information, its size is still an issue for a MIMO wireless communication. For instance, in a 2×2 MIMO wireless communication, the feedback needs four elements that are all complex Cartesian coordinate values [V11 V12; V21 V22]. In general, Vik aik+j*bik, where aik and bik are values between [−1, 1]. Thus, with 1 bit express per each element for each of the real and imaginary components, aik and bik can be either −½ or ½, which requires 4×2×1=8 bits per tone. With 4 bit expressions per each element of V(f) in an orthogonal frequency division multiplexing (OFDM) 2×2 MIMO wireless communication, the number of bits required is 1728 per tone (e.g., 4*2*54*4=1728, 4 elements per tone, 2 bits for real and imaginary components per tone, 54 data tones per frame, and 4 bits per element), which requires overhead for a packet exchange that is too large for practical applications.

Therefore, a need exists for a method and apparatus for reducing beamforming feedback information for wireless communications.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed to apparatus and methods of operation that are further described in the following Brief Description of the Drawings, the Detailed Description of the Invention, and the claims. Other features and advantages of the present invention will become apparent from the following detailed description of the invention made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a schematic block diagram of a wireless communication system in accordance with the present invention;

FIG. **2** is a schematic block diagram illustrating an embodiment of a wireless communication device in accordance with the present invention;

FIG. **3** is a schematic block diagram illustrating another embodiment of another wireless communication device in accordance with the present invention;

FIG. **4** is a schematic block diagram of baseband transmit processing in accordance with the present invention;

FIG. **5** is a schematic block diagram of baseband receive processing in accordance with the present invention;

FIG. **6** is a schematic block diagram of a beamforming wireless communication in accordance with the present invention;

FIG. **7** is a flow chart illustrating another embodiment of the present invention for providing beamforming feedback information from a receiver to a transmitter; and

FIG. **8** is a flow chart illustrating another embodiment of the present invention for providing beamforming feedback information from a receiver to a transmitter

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a schematic block diagram illustrating a communication system **10** that includes a plurality of base stations and/or access points **12**, **16**, a plurality of wireless communication devices **18-32** and a network hardware component **34**. Note that the network hardware **34**, which may be a router, switch, bridge, modem, system controller, et cetera provides a wide area network connection **42** for the communication system **10**. Further note that the wireless communication devices **18-32** may be laptop host computers **18** and **26**, personal digital assistant hosts **20** and **30**, personal computer hosts **24** and **32** and/or cellular telephone hosts **22** and **28**. The details of the wireless communication devices will be described in greater detail with reference to FIG. **2**.

Wireless communication devices **22**, **23**, and **24** are located within an independent basic service set (IBSS) area and communicate directly (i.e., point to point). In this configuration, these devices **22**, **23**, and **24** may only communicate with each other. To communicate with other wireless communication devices within the system **10** or to communicate outside of the system **10**, the devices **22**, **23**, and/or **24** need to affiliate with one of the base stations or access points 12 or **16**.

The base stations or access points 12, **16** are located within basic service set (BSS) areas **11** and **13**, respectively, and are operably coupled to the network hardware **34** via local area network connections **36**, **38**. Such a connection provides the base station or access point **12**, **16** with connectivity to other devices within the system 10 and provides connectivity to other networks via the WAN connection **42**. To communicate with the wireless communication devices within its BSS **11** or **13**, each of the base stations or access points **12-16** has an associated antenna or antenna array. For instance, base station or access point **12** wirelessly communicates with wireless communication devices **18** and **20** while base station or access point **16** wirelessly communicates with wireless communication devices **26-32**. Typically, the wireless communication devices register with a particular base station or access point **12**, **16** to receive services from the communication system **10**.

Typically, base stations are used for cellular telephone systems and like-type systems, while access points are used for in-home or in-building wireless networks (e.g., IEEE 802.11 and versions thereof, Bluetooth, and/or any other type of radio frequency based network protocol). Regardless of the particular type of communication system, each wireless communication device includes a built-in radio and/or is coupled to a radio.

FIG. 2 is a schematic block diagram illustrating an embodiment of a wireless communication device that includes the host device 18-32 and an associated radio 60. For cellular telephone hosts, the radio 60 is a built-in component. For personal digital assistants hosts, laptop hosts, and/or personal computer hosts, the radio 60 may be built-in or an externally coupled component.

As illustrated, the host device 18-32 includes a processing module 50, memory 52, a radio interface 54, an input interface 58, and an output interface 56. The processing module 50 and memory 52 execute the corresponding instructions that are typically done by the host device. For example, for a cellular telephone host device, the processing module 50 performs the corresponding communication functions in accordance with a particular cellular telephone standard.

The radio interface 54 allows data to be received from and sent to the radio 60. For data received from the radio 60 (e.g., inbound data), the radio interface 54 provides the data to the processing module 50 for further processing and/or routing to the output interface 56. The output interface 56 provides connectivity to an output display device such as a display, monitor, speakers, et cetera such that the received data may be displayed. The radio interface 54 also provides data from the processing module 50 to the radio 60. The processing module 50 may receive the outbound data from an input device such as a keyboard, keypad, microphone, et cetera via the input interface 58 or generate the data itself. For data received via the input interface 58, the processing module 50 may perform a corresponding host function on the data and/or route it to the radio 60 via the radio interface 54.

Radio 60 includes a host interface 62, digital receiver processing module 64, an analog-to-digital converter 66, a high pass and low pass filter module 68, an IF mixing down conversion stage 70, a receiver filter 71, a low noise amplifier 72, a transmitter/receiver switch 73, a local oscillation module 74, memory 75, a digital transmitter processing module 76, a digital-to-analog converter 78, a filtering/gain module 80, an IF mixing up conversion stage 82, a power amplifier 84, a transmitter filter module 85, a channel bandwidth adjust module 87, and an antenna 86. The antenna 86 may be a single antenna that is shared by transmit and receive paths as regulated by the TxRx switch 73, or may include separate antennas for the transmit path and receive path. The antenna implementation will depend on the particular standard to which the wireless communication device is compliant.

The digital receiver processing module 64 and the digital transmitter processing module 76, in combination with operational instructions stored in memory 75, execute digital receiver functions and digital transmitter functions, respectively. The digital receiver functions include, but are not limited to, digital intermediate frequency to baseband conversion, demodulation, constellation demapping, descrambling, and/or decoding. The digital transmitter functions include, but are not limited to, encoding, scrambling, constellation mapping, modulation, and/or digital baseband to IF conversion. The digital receiver and transmitter processing modules 64 and 76 may be implemented using a shared processing device, individual processing devices, or a plurality of processing devices. Such a processing device may be a microprocessor, micro-controller, digital signal processor, microcomputer, central processing unit, field programmable gate array, programmable logic device, state machine, logic circuitry, analog circuitry, digital circuitry, and/or any device that manipulates signals (analog and/or digital) based on operational instructions. The memory 75 may be a single memory device or a plurality of memory devices. Such a memory device may be a read-only memory, random access memory, volatile memory, non-volatile memory, static memory, dynamic memory, flash memory, and/or any device that stores digital information. Note that when the processing module 64 and/or 76 implements one or more of its functions via a state machine, analog circuitry, digital circuitry, and/or logic circuitry, the memory storing the corresponding operational instructions is embedded with the circuitry comprising the state machine, analog circuitry, digital circuitry, and/or logic circuitry.

In operation, the radio 60 receives outbound data 94 from the host device via the host interface 62. The host interface 62 routes the outbound data 94 to the digital transmitter processing module 76, which processes the outbound data 94 in accordance with a particular wireless communication standard (e.g., IEEE 802.11, Bluetooth, et cetera) to produce digital transmission formatted data 96. The digital transmission formatted data 96 will be digital base-band signals (e.g., have a zero IF) or a digital low IF signals, where the low IF typically will be in the frequency range of one hundred kilohertz to a few megahertz.

The digital-to-analog converter 78 converts the digital transmission formatted data 96 from the digital domain to the analog domain. The filtering/gain module 80 filters and/or adjusts the gain of the analog signals prior to providing it to the IF mixing stage 82. The IF mixing stage 82 converts the analog baseband or low IF signals into RF signals based on a transmitter local oscillation 83 provided by local oscillation module 74. The power amplifier 84 amplifies the RF signals to produce outbound RF signals 98, which are filtered by the transmitter filter module 85. The antenna 86 transmits the outbound RF signals 98 to a targeted device such as a base station, an access point and/or another wireless communication device.

The radio 60 also receives inbound RF signals 88 via the antenna 86, which were transmitted by a base station, an access point, or another wireless communication device. The antenna 86 provides the inbound RF signals 88 to the receiver filter module 71 via the TxRx switch 73, where the Rx filter 71 bandpass filters the inbound RF signals 88. The Rx filter 71 provides the filtered RF signals to low noise amplifier 72, which amplifies the signals 88 to produce an amplified inbound RF signals. The low noise amplifier 72 provides the amplified inbound RF signals to the IF mixing module 70, which directly converts the amplified inbound RF signals into an inbound low IF signals or baseband signals based on a receiver local oscillation 81 provided by local oscillation module 74. The down conversion module 70 provides the inbound low IF signals or baseband signals to the filtering/gain module 68. The high pass and low pass filter module 68 filters, based on settings provided by the channel bandwidth adjust module 87, the inbound low IF signals or the digital reception formatted data to produce filtered inbound signals.

The analog-to-digital converter 66 converts the filtered inbound signals from the analog domain to the digital domain to produce digital reception formatted data 90, where the digital reception formatted data 90 will be digital base-band signals or digital low IF signals, where the low IF typically will be in the frequency range of one hundred kilohertz to a few megahertz. The digital receiver processing module 64, based on settings provided by the channel bandwidth adjust module 87, decodes, descrambles, demaps, and/or demodulates the digital reception formatted data 90 to recapture inbound data 92 in accordance with the particular wireless communication standard being implemented by radio 60. The host interface 62 provides the recaptured inbound data 92 to the host device 18-32 via the radio interface 54.

As one of average skill in the art will appreciate, the wireless communication device of FIG. 2 may be implemented using one or more integrated circuits. For example, the host device may be implemented on one integrated circuit, the digital receiver processing module 64, the digital transmitter processing module 76 and memory 75 may be implemented on a second integrated circuit, and the remaining components of the radio 60, less the antenna 86, may be implemented on a third integrated circuit. As an alternate example, the radio 60 may be implemented on a single integrated circuit. As yet another example, the processing module 50 of the host device and the digital receiver and transmitter processing modules 64 and 76 may be a common processing device implemented on a single integrated circuit. Further, the memory 52 and memory 75 may be implemented on a single integrated circuit and/or on the same integrated circuit as the common processing modules of processing module 50 and the digital receiver and transmitter processing module 64 and 76.

FIG. 3 is a schematic block diagram illustrating another embodiment of a wireless communication device that includes the host device 18-32 and an associated radio 60. For cellular telephone hosts, the radio 60 is a built-in component. For personal digital assistants hosts, laptop hosts, and/or personal computer hosts, the radio 60 may be built-in or an externally coupled component.

As illustrated, the host device 18-32 includes a processing module 50, memory 52, radio interface 54, input interface 58 and output interface 56. The processing module 50 and memory 52 execute the corresponding instructions that are typically done by the host device. For example, for a cellular telephone host device, the processing module 50 performs the corresponding communication functions in accordance with a particular cellular telephone standard.

The radio interface 54 allows data to be received from and sent to the radio 60. For data received from the radio 60 (e.g., inbound data), the radio interface 54 provides the data to the processing module 50 for further processing and/or routing to the output interface 56. The output interface 56 provides connectivity to an output display device such as a display, monitor, speakers, et cetera such that the received data may be displayed. The radio interface 54 also provides data from the processing module 50 to the radio 60. The processing module 50 may receive the outbound data from an input device such as a keyboard, keypad, microphone, et cetera via the input interface 58 or generate the data itself. For data received via the input interface 58, the processing module 50 may perform a corresponding host function on the data and/or route it to the radio 60 via the radio interface 54.

Radio 60 includes a host interface 62, a baseband processing module 100, memory 65, a plurality of radio frequency (RF) transmitters 106-110, a transmit/receive (T/R) module 114, a plurality of antennas 81-85, a plurality of RF receivers 118-120, a channel bandwidth adjust module 87, and a local oscillation module 74. The baseband processing module 100, in combination with operational instructions stored in memory 65, executes digital receiver functions and digital transmitter functions, respectively. The digital receiver functions include, but are not limited to, digital intermediate frequency to baseband conversion, demodulation, constellation demapping, decoding, de-interleaving, fast Fourier transform, cyclic prefix removal, space and time decoding, and/or descrambling. The digital transmitter functions include, but are not limited to, encoding, scrambling, interleaving, constellation mapping, modulation, inverse fast Fourier transform, cyclic prefix addition, space and time encoding, and digital baseband to IF conversion. The baseband processing modules 100 may be implemented using one or more processing devices. Such a processing device may be a microprocessor, micro-controller, digital signal processor, microcomputer, central processing unit, field programmable gate array, programmable logic device, state machine, logic circuitry, analog circuitry, digital circuitry, and/or any device that manipulates signals (analog and/or digital) based on operational instructions. The memory 65 may be a single memory device or a plurality of memory devices. Such a memory device may be a read-only memory, random access memory, volatile memory, non-volatile memory, static memory, dynamic memory, flash memory, and/or any device that stores digital information. Note that when the processing module 100 implements one or more of its functions via a state machine, analog circuitry, digital circuitry, and/or logic circuitry, the memory storing the corresponding operational instructions is embedded with the circuitry comprising the state machine, analog circuitry, digital circuitry, and/or logic circuitry.

In operation, the radio 60 receives outbound data 94 from the host device via the host interface 62. The baseband processing module 64 receives the outbound data 94 and, based on a mode selection signal 102, produces one or more outbound symbol streams 104. The mode selection signal 102 will indicate a particular mode of operation that is compliant with one or more specific modes of the various IEEE 802.11 standards. For example, the mode selection signal 102 may indicate a frequency band of 2.4 GHz, a channel bandwidth of 20 or 22 MHz and a maximum bit rate of 54 megabits-per-second. In this general category, the mode selection signal will further indicate a particular rate ranging from 1 megabit-per-second to 54 megabits-per-second. In addition, the mode selection signal will indicate a particular type of modulation, which includes, but is not limited to, Barker Code Modulation, BPSK, QPSK, CCK, 16 QAM and/or 64 QAM. The mode select signal 102 may also include a code rate, a number of coded bits per subcarrier (NBPSC), coded bits per OFDM symbol (NCBPS), and/or data bits per OFDM symbol (NDBPS). The mode selection signal 102 may also indicate a particular channelization for the corresponding mode that provides a channel number and corresponding center frequency. The mode select signal 102 may further indicate a power spectral density mask value and a number of antennas to be initially used for a MIMO communication.

The baseband processing module 100, based on the mode selection signal 102 produces one or more outbound symbol streams 104 from the outbound data 94. For example, if the mode selection signal 102 indicates that a single transmit antenna is being utilized for the particular mode that has been selected, the baseband processing module 100 will produce a single outbound symbol stream 104. Alternatively, if the mode select signal 102 indicates 2, 3 or 4 antennas, the baseband processing module 100 will produce 2, 3 or 4 outbound symbol streams 104 from the outbound data 94.

Depending on the number of outbound streams 104 produced by the baseband module 10, a corresponding number of the RF transmitters 106-110 will be enabled to up convert the outbound symbol streams 104 into outbound RF signals 112. In general, each of the RF transmitters 106-110 includes a digital filter and upsampling module, a digital to analog conversion module, an analog filter module, a frequency up conversion module, a power amplifier, and a radio frequency bandpass filter. The RF transmitters 106-110 provide the outbound RF signals 112 to the transmit/receive module 114, which provides each outbound RF signal to a corresponding antenna 81-85.

When the radio **60** is in the receive mode, the transmit/receive module **114** receives one or more inbound RF signals **116** via the antennas **81-85** and provides them to one or more RF receivers **118-122**. The RF receiver **118-122**, based on settings provided by the channel bandwidth adjust module **87**, down converts the inbound RF signals **116** into a corresponding number of inbound symbol streams **124**. The number of inbound symbol streams **124** will correspond to the particular mode in which the data was received. The baseband processing module **100** converts the inbound symbol streams **124** into inbound data **92**, which is provided to the host device **18-32** via the host interface **62**.

As one of average skill in the art will appreciate, the wireless communication device of FIG. **3** may be implemented using one or more integrated circuits. For example, the host device may be implemented on one integrated circuit, the baseband processing module **100** and memory **65** may be implemented on a second integrated circuit, and the remaining components of the radio **60**, less the antennas **81-85**, may be implemented on a third integrated circuit. As an alternate example, the radio **60** may be implemented on a single integrated circuit. As yet another example, the processing module **50** of the host device and the baseband processing module **100** may be a common processing device implemented on a single integrated circuit. Further, the memory **52** and memory **65** may be implemented on a single integrated circuit and/or on the same integrated circuit as the common processing modules of processing module **50** and the baseband processing module **100**.

FIG. **4** is a schematic block diagram of baseband transmit processing 100-TX within the baseband processing module **100**, which includes an encoding module **121**, a puncture module **123**, a switch, a plurality of interleaving modules **125**, **126**, a plurality of constellation encoding modules **128**, **130**, a beamforming module (V) **132**, and a plurality of inverse fast Fourier transform (IFFT) modules **134**, **136** for converting the outbound data **94** into the outbound symbol stream(s) **104**. As one of ordinary skill in the art will appreciate, the baseband transmit processing may include two or more of each of the interleaving modules **125**, **126**, the constellation mapping modules **128**, **130**, and the IFFT modules **134**, **136**. In addition, one of ordinary skill in art will further appreciate that the encoding module **121**, puncture module **123**, the interleaving modules **124**, **126**, the constellation mapping modules **128**, **130**, and the IFFT modules **134**, **136** may function in accordance with one or more wireless communication standards including, but not limited to, IEEE 802.11a, b, g, n.

In one embodiment, the encoding module **121** is operably coupled to convert outbound data **94** into encoded data in accordance with one or more wireless communication standards. The puncture module **123** punctures the encoded data to produce punctured encoded data. The plurality of interleaving modules **125**, **126** is operably coupled to interleave the punctured encoded data into a plurality of interleaved streams of data. The plurality of constellation mapping modules **128**, **130** is operably coupled to map the plurality of interleaved streams of data into a plurality of streams of data symbols. The beamforming module **132** is operably coupled to beamform, using a unitary matrix having polar coordinates, the plurality of streams of data symbols into a plurality of streams of beamformed symbols. The plurality of IFFT modules **134**, **136** is operably coupled to convert the plurality of streams of beamformed symbols into a plurality of outbound symbol streams.

The beamforming module **132** is operably coupled to multiply a beamforming unitary matrix (V) with baseband signals provided by the plurality of constellation mapping modules **128**, **130**. The beamforming module **132** determines the beamforming unitary matrix V from feedback information from the receiver, wherein the feedback information includes a calculated expression of the beamforming matrix V having polar coordinates. The beamforming module **132** generates the beamforming unitary matrix V to satisfy the conditions of "V*V=VV*="I", where "I" is an identity matrix of [1 0; 0 1] for 2×2 MIMO wireless communication, is [1 0 0; 0 1 0; 0 0 1] for 3×3 MIMO wireless communication, or is [1 0 0 0; 0 1 0 0; 0 0 1 0; 0 0 0 1] for 4×4 MIMO wireless communication. In this equation, V*V means "conjugate (V) times V" and VV* means "V times conjugate (V)". Note that V may be a 2×2 unitary matrix for a 2×2 MIMO wireless communication, a 3×3 unitary matrix for a 3×3 MIMO wireless communication, and a 4×4 unitary matrix for a 4×4 MIMO wireless communication. Further note that for each column of V, a first row of polar coordinates including real values as references and a second row of polar coordinates including phase shift values.

In one embodiment, the constellation mapping modules **128**, **130** function in accordance with one of the IEEE 802.11x standards to provide an OFDM (Orthogonal Frequency Domain Multiplexing) frequency domain baseband signals that includes a plurality of tones, or subcarriers, for carrying data. Each of the data carrying tones represents a symbol mapped to a point on a modulation dependent constellation map. For instance, a 16 QAM (Quadrature Amplitude Modulation) includes 16 constellation points, each corresponding to a different symbol. For an OFDM signal, the beamforming module **132** may regenerate the beamforming unitary matrix V for each tone from each constellation mapping module **128**, **130**, use the same beamforming unitary matrix for each tone from each constellation mapping module **128**, **130**, or a combination thereof.

The beamforming unitary matrix varies depending on the number of transmit paths (i.e., transmit antennas–M) and the number of receive paths (i.e., receiver antennas–N) for an M×N MIMO communication. For instance, for a 2×2 MIMO communication, the beamforming unitary matrix may be:

$$V = (V)ij = \begin{bmatrix} \cos\psi_1 & \cos\psi_2 \\ \sin\psi_1 e^{j\phi_1} & \sin\psi_2 e^{j\phi_2} \end{bmatrix}$$

In order to satisfy V*V=I, it needs to satisfy followings.

$$\cos\psi_1 \cos\psi_2 + \sin\psi_1 \sin\psi_2 e^{j(\phi_1-\phi_2)} = 0$$

$$\cos\psi_1 \cos\psi_2 + \sin\psi_1 \sin\psi_2 e^{j(\phi_2-1002)} = 0$$

Where i, j=1, 2; ψ_1, Φ_1, ψ_2, and Φ_2 represent angles of the unit circle, wherein absolute value of $\psi_1-\psi_2=\pi/2$ and $\Phi_1=\Phi_2$ or $\Phi_1=\Phi_2+\pi$ and $\psi_1+\psi_2=\pi/2$.

Therefore, with Φ_1 and ψ_1, the beamforming module **132** may regenerate V per each tone. For example, With 4-bits expression for angle Φ_1 and 3-bits for angle ψ_1, and 1-bit for the index for #1 or #2 in 54 tones, (i.e., 8-bits per tone) total feedback information may be 8×54/8 54 bytes. (ψ in [0, π] Φ in [$-\pi\pi$]).

For a 3×3 MIMO communication, the beamforming unitary matrix may be:

$$V=(V)ij=\begin{bmatrix}\cos\psi_1 & \cos\psi_2 & \cos\psi_3\\ \sin\psi_1\cos\theta_1 e^{j\phi_{21}} & \sin\psi_2\cos\theta_2 e^{j\phi_{22}} & \sin\psi_3\cos\theta_3 e^{j\phi_{23}}\\ \sin\psi_1\sin\theta_1 e^{j\phi_{31}} & \sin\psi_2\sin\theta_2 e^{j\phi_{32}} & \sin\psi_3\sin\theta_3 e^{j\phi_{33}}\end{bmatrix}$$

where i, j=1, 2, 3; ψ_1, ψ_2, ψ_3, θ_1, θ_2, θ_3, Φ_{21}, Φ_{22}, Φ_{23}, Φ_{32}, Φ_{33} represent angles of the unit circle, wherein Diagonal (V*V)=1s, and wherein:

$$\psi_i=\cos^{-1}V_{1i},\ \theta_i=\cos^{-1}\left|\frac{V_{2i}}{\sin\psi_i}\right|$$

$$\phi_{2i}=\angle(V_{2i}),\ \phi_{3i}=\angle(V_{3i})$$

In this example, with 12 angles, the beamforming module **132** may regenerate V as a 3×3 matrix per tone. With 4-bits for expression for the angles, a 54 tone signal may have feedback information of 324 bytes (e.g., 4×12×54/8).

For a 4×4 MIMO communication, the beamforming unitary matrix may be:

$$V=(V)ij=\begin{bmatrix}\cos\psi_1\cos\varphi_1 & \cos\psi_2\cos\varphi_2 & \cos\psi_3\cos\varphi_3 & \cos\psi_4\cos\varphi_4\\ \cos\psi_1\sin\varphi_1 e^{j\phi_{11}} & \cos\psi_2\sin\varphi_2 e^{j\phi_{12}} & \cos\psi_3\sin\varphi_3 e^{j\phi_{13}} & \cos\psi_4\sin\varphi_4 e^{j\phi_{14}}\\ \sin\psi_1\cos\theta_1 e^{j\phi_{21}} & \sin\psi_2\cos\theta_2 e^{j\phi_{22}} & \sin\psi_3\cos\theta_3 e^{j\phi_{23}} & \sin\psi_4\cos\theta_4 e^{j\phi_{24}}\\ \sin\psi_1\sin\theta_1 e^{j\phi_{31}} & \sin\psi_2\sin\theta_2 e^{j\phi_{32}} & \sin\psi_3\sin\theta_3 e^{j\phi_{33}} & \sin\psi_4\sin\theta_4 e^{j\phi_{34}}\end{bmatrix}=$$

[$\cos(\psi_1)\cos(\Phi_2)$; $\sin(\psi_1)^*e^{j\Phi 1}\sin(\psi_2)^*e^{j\Phi 2}$], where i,j=1, 2, 3, 4; wherein ψ_1, ψ_2, ψ_3, ψ_4, θ_1, θ_2, θ_3, θ_4, ϕ_1, ϕ_2, ϕ_3, ϕ_4, Φ_{21}, Φ_{22}, Φ_{23}, Φ_{24}, Φ_{31}, Φ_{32}, Φ_{33}, Φ_{33}, Φ_{41}, Φ_{42}, Φ_{43}, Φ_{43} represent angles of the unit circle, wherein Diagonal (V*V)=1s, and wherein:

$$\psi_i=\cos^{-1}\left(\sqrt{|V_{1i}|^2+|V_{2i}|^2}\right),$$

$$\varphi_i=\cos^{-1}\left(\frac{V_{1i}}{\cos\psi_i}\right),$$

$$\theta_i=\cos^{-1}\left|\frac{V_{3i}}{\sin\psi_i}\right|$$

$$\phi_{1i}=\angle(V_{2i}),$$

$$\phi_{2i}=\angle(V_{3i}),$$

$$\phi_{3i}=\angle(V_{4i})$$

In this example, with 24 angles, the beamforming module **132** may regenerate V as a 4×4 matrix per tone. With 4-bits for expression for the angles, a 54 tone signal may have feedback information of 648 bytes (e.g., 4×24×54/8).

The baseband transmit processing 100-TX receives the polar coordinates Φ andψ V from the receiver as feedback information as will described in greater detail with reference to FIG. **6**.

FIG. **5** is a schematic block diagram of baseband receive processing 100-RX that includes a plurality of fast Fourier transform (FFT) modules **140**, **142**, a beamforming (U) module **144**, a plurality of constellation demapping modules **146**, **148**, a plurality of deinterleaving modules **150**, **152**, a switch, a depuncture module **154**, and a decoding module **156** for converting a plurality of inbound symbol streams **124** into inbound data **92**. As one of ordinary skill in the art will appreciate, the baseband receive processing 100-RX may include two or more of each of the deinterleaving modules **150**, **152**, the constellation demapping modules **146**, **148**, and the FFT modules **140**, **142**. In addition, one of ordinary skill in art will further appreciate that the decoding module **156**, depuncture module **154**, the deinterleaving modules **150**, **152**, the constellation decoding modules **146**, **148**, and the FFT modules **140**, **142** may be function in accordance with one or more wireless communication standards including, but not limited to, IEEE 802.11a, b, g, n.

In one embodiment, a plurality of FFT modules **140**, **142** is operably coupled to convert a plurality of inbound symbol streams **124** into a plurality of streams of beamformed symbols. The inverse beamforming module **144** is operably coupled to inverse beamform, using a unitary matrix having polar coordinates, the plurality of streams of beamformed symbols into a plurality of streams of data symbols. The plurality of constellation demapping modules is operably coupled to demap the plurality of streams of data symbols into a plurality of interleaved streams of data. The plurality of deinterleaving modules is operably coupled to deinterleave the plurality of interleaved streams of data into encoded data. The decoding module is operably coupled to convert the encoded data into inbound data **92**.

The beamforming module **144** is operably coupled to multiply a beamforming unitary matrix (U) with baseband signals provided by the plurality of FFT modules **140**, **142**. The FFT modules **140**, **142** function in accordance with one of the IEEE 802.11x standards to provide an OFDM (Orthogonal Frequency Domain Multiplexing) frequency domain baseband signals that includes a plurality of tones, or subcarriers, for carrying data. Each of the data carrying tones represents a symbol mapped to a point on a modulation dependent constellation map. The baseband receive processing 100-RX is further functional to produce feedback information for the transmitter as further described with reference to FIG. **6**.

FIG. **6** is a schematic block diagram of a beamforming wireless communication where H=UDV* (H—represents the channel, U is the receiver beamforming unitary matrix, and V* is the conjugate of the transmitter beamforming unitary matrix. With H=UDV*, y (the received signal)=Hx+N, where x represents the transmitted signals and N represents noise. If z=Vx, then U*y=U*UDV*Vz+U*n=Dz+N.

From this expression, the baseband receive processing 100-RX may readily determine the feedback of V, where V includes polar coordinates. For instance, the receiver may decompose the channel using singular value decomposition (SVD) and send information relating only to a calculated value of the transmitter's beamforming matrix (V) as the feedback information. In this approach, the receiver calculates (V) based on H=UDV*, where H is the channel response, D is a diagonal matrix, and U is a receiver unitary matrix. This approach reduces the size of the feedback information with respect to SVD using Cartesian coordinates. For example, in a 2×2 MIMO wireless communication, the feedback needs four elements that are all complex values [V11 V12; V21 V22] with two angles (ψ and Φ). In general, Vik=aik+j*bik, where aik and bik are values between [−1, 1]. To cover [−1, 1], ψ is in [0, π] and Φ is in [0, 2π]. With π/2 resolutions for angles, ψ needs to be π/4 or 3π/4, i.e., cos(ψ)= 0.707 or −0.707, which requires 1 bit, where Φ needs to be either π/4, 3π/4, 5π/4, 7π/4, i.e., exp(j Φ)=0.707(1+j), 0.707 (1−j), 0.707(−1+j) or 0.707(−1−j), which requires 2 bits. With π/4 resolutions for angles, ψ needs to be π/8, 3π/8, 5π/8, or 7π/8, which requires 2 bits, where Φ needs to be either π/8, 3π/8, 5π8, 7π/8, 9π8, 11π/8, 13π/8 or 15π/8, which requires 4 bits. So, for an example of 2×2 system to use 4 bits per tone, it may have 1 bit for ψ, 2 bits for 4) and 1 index bit to determine the relationship between ψ and Φ, such as either ψ1=ψ2+π and Φ1+Φ2=π/2, or ψ1=ψ2 and Φ1−Φ2=π/2.

For the same resolution in Cartesian expression of 4 bits per each element for each of the real and imaginary components, aik and bik, can be within [−½, ½], it requires 4*2*4=32 bits per tone. For OFDM MIMO wireless communications, the number of bits required is 1728 bits for the Cartesian expression. While an angle expression in accordance with the present invention requires 8 bits per tone, which for the same OFDM MIMO wireless communications would require 432 bits. This represents a significant reduction in the overhead needed for packet exchange.

FIG. **7** is a flow chart illustrating another embodiment of the present invention for providing beamforming feedback information from a receiver to a transmitter. The method **700** in particular addresses the feed back of observed transmitter beamforming information from a receiving wireless communication device to a transmitting wireless communication device. The method **700** of FIG. **7** relates to MIMO wireless communication systems, among others. Most of the operations **700** of FIG. **7** are typically performed by a baseband processing module, e.g., **100** of FIG. **3** of a receiving wireless device.

The method **700** commences with the receiving wireless communication device receiving a preamble sequence from the transmitting wireless device and estimating a channel response from the preamble sequence (step **702**). Estimating the channel response includes comparing received training symbols of the preamble to corresponding expected training symbols using any of a number of techniques that are known in the art. The receiving wireless device then determines an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a known receiver beamforming unitary matrix (U) (step **704**). The channel response (H), estimated transmitter beamforming unitary matrix (V), and the known receiver beamforming unitary matrix (U) are related by the equation H=UDV*, where, D is a diagonal matrix. Singular Value Decomposition (SVD) operations may be employed to produce the estimated transmitter beamforming unitary matrix (V) according to this equation.

According to the embodiment of FIG. **7**, the receiving wireless device produces the estimated transmitter beamforming unitary matrix (V) in Cartesian coordinates and then converts the estimated transmitter beamforming unitary matrix (V) to polar coordinates (step **706**). With the estimated transmitter beamforming unitary matrix (V) determined, the receiving wireless device then decomposes the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information (step **708**).

According to one embodiment of this operation, the decomposition operations of step **708** employ a Givens Rotation operation. The Givens Rotation relies upon the observation that, with the condition of V*V=VV*=I, some of angles of the Givens Rotation are redundant. With a decomposed matrix form for the estimated transmitter beamforming matrix (V), the set of angles fed back to the transmitting wireless device are reduced.

Operation continues with the receiving wireless device wirelessly sending the transmitter beamforming information to the transmitting wireless device (step **710**). This operation occurs with the receiving wireless device shifting to a transmit mode and sending the information back to the transmitting wireless device. The transmitting wireless device then uses the feedback components to generate a new beamforming matrix (V), which it uses for subsequent transmissions (step **712**).

FIG. **8** is a flow chart illustrating another embodiment of the present invention for providing beamforming feedback information from a receiver to a transmitter. The operations **800** of FIG. **8** are similar to the operations **700** of FIG. **7** and would typically be performed by a baseband processing module, e.g., **100** of FIG. **3** of a receiving wireless device.

The method **800** commences with the receiving wireless communication device receiving a preamble sequence from the transmitting wireless device and estimating a channel response (H) from the preamble sequence (step **802**). Techniques similar/same as those described with reference to step **702** of FIG. **7** may be employed.

The receiving wireless device then decomposes the channel response (H) based upon the receiver beamforming unitary matrix (U) to produce an estimated transmitter beamforming unitary matrix (V) (step **804**). With the estimated transmitter beamforming unitary matrix (V) determined, the receiving wireless device then decomposes the estimated transmitter beamforming unitary matrix (V) using a Givens Rotation to produce the transmitter beamforming information (step **806**). The products of this Givens Rotation are the transmitter beamforming information.

Operation continues with the receiving wireless device wirelessly sending the transmitter beamforming information to the transmitting wireless device (step **808**). This operation occurs with the receiving wireless device shifting to a transmit mode and sending the transmitter beamforming information to the transmitting wireless device. The transmitting wireless device then uses the feedback components to generate a new beamforming matrix (V), which it uses for subsequent transmissions (step **810**).

One example of a Givens Rotation matrix that may be used for the decomposition operations of step **806** (and step **708**) is:

$$G_l(\psi) = \begin{bmatrix} I_{l-1} & 0 & 0 & 0 \\ 0 & \cos\psi & \sin\psi & 0 \\ 0 & -\sin\psi & \cos\psi & 0 \\ 0 & 0 & 0 & I_{N-l-1} \end{bmatrix}$$

With this form, the Givens Rotation matrix rotates M [l,j], [l.j] to make (i,j−1)th component zero, where M [l,j],[l,j] is 2×2 block matrix at ith, jth row and ith, jth column.

Applying the Givens Rotation to the 2×2 estimated transmitter beamforming matrix (V) described above, for a particular form of the Givens Rotation, ψ in [0, π/2], φ in [−π, π] the 2×2 estimated transmitter beamforming matrix (V) can be rewritten as:

$$V = \begin{bmatrix} \cos\psi_1 & \cos\left(\frac{\pi}{2} - \psi_1\right) \\ \sin\psi_1 e^{j(\pi+\phi_2)} & \sin\left(\frac{\pi}{2} - \psi_1\right)e^{j\phi_2} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & e^{j\phi} \end{bmatrix}\begin{bmatrix} \cos\psi & \sin\psi \\ -\sin\psi & \cos\psi \end{bmatrix}$$

With angle resolution of $\pi/2^a$, where a=# of bits per angle, the total number of bits per tone is (a−1)+(a+1)=2a. With the 2×2 estimated transmitter beamforming matrix (V), ψ needs (a−1) bits to cover $[0, \pi/2]$ and ϕ needs (a+1) bits to cover $[-\pi, \pi]$. With this notation: 'a=1' means quantized angle is either $[\pi/4, 3\pi/4]$ to cover $[0, \pi]$ angle resolution of $\pi/2$; and 'a=2' means quantized angle is either $[\pi/8, 3\pi/8, 5\pi/8, 7\pi/8]$ to cover $[0, \pi]$ with angle resolution of $\pi/4$.

By using all combinations of the Givens Rotation, these concepts may be extended to an N×M matrix. Because the Givens Rotation needs real values, a phase matrix Di is applied before the Givens Rotation to yield:

$$V = \prod_{i=1}^{M}\left[D_i(1_{i-1}e^{j\phi_{ii}} \ \ldots \ e^{j\phi_{iN}})\prod_{j=i}^{N-1} G_j(\psi_{i,j})\right] \times \tilde{I}_{N\times M}$$

Where:

D_i is an N×N diagonal matrix with diagonal components in arguments.

$I_{N\times M}$ is an N×M identity matrix, where $(I)_{ii}=1$ for i=1, . . . , min(M,N).

As the reader will appreciate, the coefficients of the Givens Rotation and the phase matrix coefficients serve as the transmitter beamforming information that is sent from the receiving wireless communication device to the transmitting wireless communication device. For a 3×3 estimated transmitter beamforming matrix (V), from Givens Rotation, six angles in total (ϕ_{22}, ϕ_{23}, ϕ_{33}, ψ_{12}, ψ_{13}, ψ_{23}) are required. With angle resolution of $\pi/2^a$, where a=# of bits per angle, the total number of bits per tone is 3(a−1)+3(a+1)=6a. In such case, ψ needs (a−1) bits to cover $[0, \pi/2]$ and ϕ needs (a+1) bits to cover $[-\pi, \pi]$. Using this polar coordinates embodiment, 24 bits per sub carrier are required to achieve equivalent full resolution performance to a Cartesian coordinates solution, which requires 72 bits per sub carrier.

For a 4×4 estimated transmitter beamforming matrix (V), from Givens Rotation, twelve angles in total (ϕ_{22}, ϕ_{23}, ϕ_{24}, ϕ_{33}, ϕ_{34}, ϕ_{44}, ψ_{12}, ψ_{13}, ψ_{23}, ψ_{23}, ψ_{24}, ψ_{33}) are required. With angle resolution of $\pi/2^a$, where a=# of bits per angle, the total number of bits per tone is 6(a−1)+6(a+1)=12a. In such case, ψ needs (a−1) bits to cover $[0, \pi/2]$ and ϕ needs (a+1) bits to cover $[-\pi, \pi]$. Using this polar coordinates embodiment, 48 bits per sub carrier are required to achieve equivalent full resolution performance to a Cartesian coordinates solution, which requires 128 bits per sub carrier.

Using these techniques, for a simple case of 2×2 system with 20 MHz BW, the feedback of transmitter beamforming information requires 10*52/8=65 bytes. For the worst case of 4×4 system with 40 MHz BW (108 tones), the feedback requires 48*108/8=648 bytes. Efficiencies can be further obtained by using the correlation property of adjacent tones. (e.g., sending one information per every three tones). However, with a slowly fading channel, frequent channel feedback is not required.

The preceding discussion has presented a method and apparatus for reducing feedback information for beamforming in a wireless communication by using polar coordinates. As one of average skill in the art will appreciate, other embodiments may be derived from the present teachings without deviating from the scope of the claims.

What is claimed is:

1. A method for feeding back transmitter beamforming information from a receiving wireless communication device to a transmitting wireless communication device, the method comprising:

the receiving wireless communication device receiving a preamble sequence from the transmitting wireless device;

the receiving wireless device estimating a channel response based upon the preamble sequence;

the receiving wireless device determining an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U);

the receiving wireless device decomposing the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information; and

the receiving wireless device wirelessly sending the transmitter beamforming information to the transmitting wireless device.

2. The method of claim 1 wherein the receiving wireless device determining an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U) comprises:

the receiving wireless device producing the estimated transmitter beamforming unitary matrix (V) in Cartesian coordinates; and

the receiving wireless device converting the estimated transmitter beamforming unitary matrix (V) to polar coordinates.

3. The method of claim 1 wherein the channel response (H), estimated transmitter beamforming unitary matrix (V), and the receiver beamforming unitary matrix (U) are related by the equation:

$$H=UDV^*$$

where, D is a diagonal matrix.

4. The method of claim 3, wherein the receiving wireless device determining an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U) comprises performing a Singular Value Decomposition (SVD) operation.

5. The method of claim 1, wherein the receiving wireless device decomposing the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information comprises the receiving wireless device decomposing the estimated transmitter beamforming unitary matrix (V) using a QR decomposition technique.

6. The method of claim 5, wherein the QR decomposition technique comprises a Givens Rotation operation performed according to the equation:

$$V = \prod_{i=1}^{M}\left[D_i(1_{i-1}e^{j\phi_{ii}} \ \ldots \ e^{j\phi_{iN}})\prod_{j=i}^{N-1} G_j(\psi_{i,j})\right] \times \tilde{I}_{N\times M}$$

Where:

D_i is an N×N diagonal matrix with diagonal components in arguments;

$I_{N \times M}$ is an N×M identity matrix, where $(I)_{ii}$ 1 for i=1, . . . , min(M,N); and

wherein the transmitter beamforming information includes angles corresponding to elements of the diagonal matrix D and elements of the Givens Rotation, wherein N is a number of transmit antennas, M is a number of receive antennas, and wherein i and j are each integers.

7. The method of claim 1, wherein:

the transmitting wireless device transmits on N antennas; and

the receiving wireless device receives on M antennas.

8. The method of claim 1, wherein at least one of the transmitting wireless device and the receiving wireless device supports Multiple Input Multiple Output (MIMO) operations.

9. A wireless communication device comprising:

a plurality of Radio Frequency (RF) components operable to receive an RF signal and to convert the RF signal to a baseband signal; and

a baseband processing module operable to:

receive a preamble sequence carried by the baseband signal;

estimate a channel response based upon the preamble sequence;

determine an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U);

decompose the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information; and

form a baseband signal employed by the plurality of RF components to wirelessly send the transmitter beamforming information to the transmitting wireless device.

10. The wireless communication device of claim 9, wherein in determining an estimated transmitter beamforming unitary matrix (V) based upon the channel response and a receiver beamforming unitary matrix (U), the baseband processing module is operable to:

produce the estimated transmitter beamforming unitary matrix (V) in Cartesian coordinates; and

convert the estimated transmitter beamforming unitary matrix (V) to polar coordinates.

11. The wireless communication device of claim 9, wherein the channel response (H), estimated transmitter beamforming unitary matrix (V), and the receiver beamforming unitary matrix (U) are related by the equation:

$$H=UDV^*$$

where, D is a diagonal matrix.

12. The wireless communication device of claim 9, wherein in determining the estimated transmitter beamforming unitary matrix (V) based upon the channel response and the receiver beamforming unitary matrix (U), the baseband processing module performs Singular Value Decomposition (SVD) operations.

13. The wireless communication device of claim 9, wherein in decomposing the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information, the baseband processing module decomposes the estimated transmitter beamforming unitary matrix (V) using a QR decomposition technique.

14. The wireless communication device of claim 13, wherein the QR decomposition technique comprises a Givens Rotation operation performed according to the equation:

$$V = \prod_{i=1}^{M} \left[D_i(1_{i-1}\, e^{j\phi_{i,i}} \ \ldots \ e^{j\phi_{i,N}}) \prod_{j=i}^{N-1} G_j(\psi_{i,j}) \right] \times \tilde{I}_{N \times M}$$

Where:

D_i is an N×N diagonal matrix with diagonal components in arguments;

$I_{N \times M}$ is an N×M identity matrix, where $(I)_{ii}=1$ for i=1, . . . , min(M,N); and

wherein the transmitter beamforming information includes angles corresponding to elements of the diagonal matrix D and elements of the Givens Rotation, wherein N is a number of transmit antennas, M is a number of receive antennas, and wherein i and j are each integers.

15. The wireless communication device of claim 10, wherein:

the transmitting wireless device transmits on N antennas; and

the wireless communication device includes M antennas.

16. The wireless communication device of claim 10, wherein the wireless communication device supports Multiple Input Multiple Output (MIMO) operations.

17. A method for feeding back transmitter beamforming information from a receiving wireless communication device to a transmitting wireless communication device, the method comprising:

the receiving wireless communication device receiving a preamble sequence from the transmitting wireless device;

the receiving wireless device estimating a channel response based upon the preamble sequence;

the receiving wireless device decomposing the channel response based upon the channel response and a receiver beamforming unitary matrix (U) to produce an estimated transmitter beamforming unitary matrix (V);

the receiving wireless device decomposing the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information; and

the receiving wireless device wirelessly sending the transmitter beamforming information to the transmitting wireless device.

18. The method of claim 17, wherein the receiving wireless device decomposing the channel response based upon the channel response and a receiver beamforming unitary matrix (U) to produce an estimated transmitter beamforming unitary matrix (V) includes performing a Singular Value Decomposition (SVD) operation.

19. The method of claim 17, wherein the receiving wireless device decomposing the estimated transmitter beamforming unitary matrix (V) to produce the transmitter beamforming information comprises the receiving wireless device decomposing the estimated transmitter beamforming unitary matrix (V) using a Givens Rotation operation performed according to the equation:

$$V = \prod_{i=1}^{M} \left[D_i(1_{i-1}\, e^{j\phi_{i,i}} \ \ldots \ e^{j\phi_{i,N}}) \prod_{j=i}^{N-1} G_j(\psi_{i,j}) \right] \times \tilde{I}_{N \times M}$$

Where:

D_i is an N×N diagonal matrix with diagonal components in arguments;

$I_{N\times M}$ is an N×M identity matrix, where $(I)_{ii}=1$ for i=1, . . . , min(M,N); and

wherein the transmitter beamforming information includes angles corresponding to elements of the diagonal matrix D and elements of the Givens Rotation, wherein N is a number of transmit antennas, M is a number of receive antennas, and wherein i and j are each integers.

20. The method of claim **19**, wherein the transmitter beamforming information comprises element values of the diagonal matrix D and element values of the Givens Rotation matrix.

* * * * *

EXHIBIT G

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United States Patent and Trademark Office

September 25, 2018

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U.S. PATENT: ***7,957,450***
ISSUE DATE: ***June 07, 2011***

By Authority of the
Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office

P. SWAIN
Certifying Officer

US007957450B2

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

(10) **Patent No.:** **US 7,957,450 B2**
(45) **Date of Patent:** **Jun. 7, 2011**

(54) **METHOD AND SYSTEM FOR FRAME FORMATS FOR MIMO CHANNEL MEASUREMENT EXCHANGE**

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(73) Assignee: **Broadcom Corporation**

(*) 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.: **12/506,053**

(22) Filed: **Jul. 20, 2009**

(65) **Prior Publication Data**

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Related U.S. Application Data

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(60) Provisional application No. 60/636,255, filed on Dec. 14, 2004.

(51) **Int. Cl.**
H04B 1/00 (2006.01)

(52) **U.S. Cl.** **375/130**

(58) **Field of Classification Search** 375/267, 375/316, 340, 347, 349, 299; 370/338, 401; 455/101, 132, 296

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,676,007 B1 * 3/2010 Choi et al. 375/347
2004/0085939 A1 5/2004 Wallace et al.
2006/0193298 A1 * 8/2006 Kishigami et al. 370/338

FOREIGN PATENT DOCUMENTS

WO 03/085876 10/2003

OTHER PUBLICATIONS

Christopher J. Hansen, IEEE 802.11 Wireless LANs WWiSE Proposal: High Throughput Extension to the 802.11 Standard, Dec. 20, 2004.

Syed Aon Mujtaba, IEEE 802.11 Wireless LANs TGn Sync Proposal Technical Specification, Jan. 18, 2005.

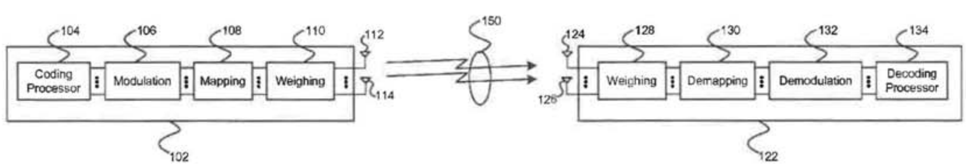
* cited by examiner

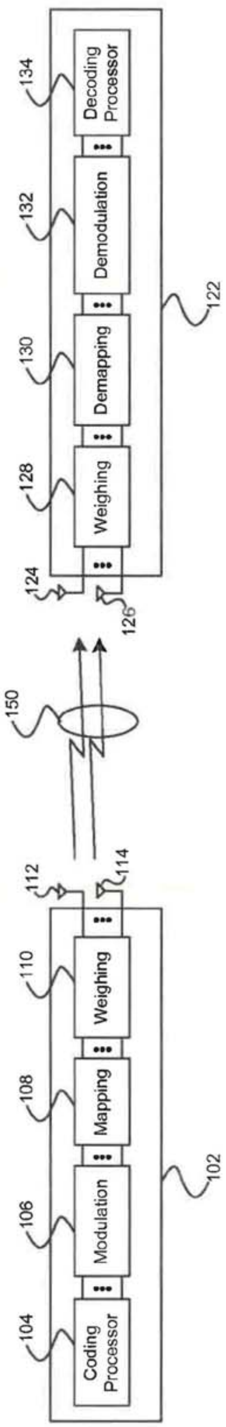
Primary Examiner — Khai Tran
(74) *Attorney, Agent, or Firm* — McAndrews, Held & Malloy, Ltd.

(57) **ABSTRACT**

A method and system for frame formats for MIMO channel measurement exchange is provided. Aspects of a method for communicating information in a communication system may comprise transmitting data via a plurality of radio frequency (RF) channels utilizing a plurality of transmitting antenna, receiving feedback information via at least one of a plurality of RF channels, and modifying a transmission mode based on the feedback information. Aspects of a method for communicating information in a communication system may also comprise receiving data via a plurality of receiving antenna, transmitting feedback information via at least one of the plurality of RF channels, and requesting modification of a transmission mode for the received data in transmitted response messages comprising the feedback information.

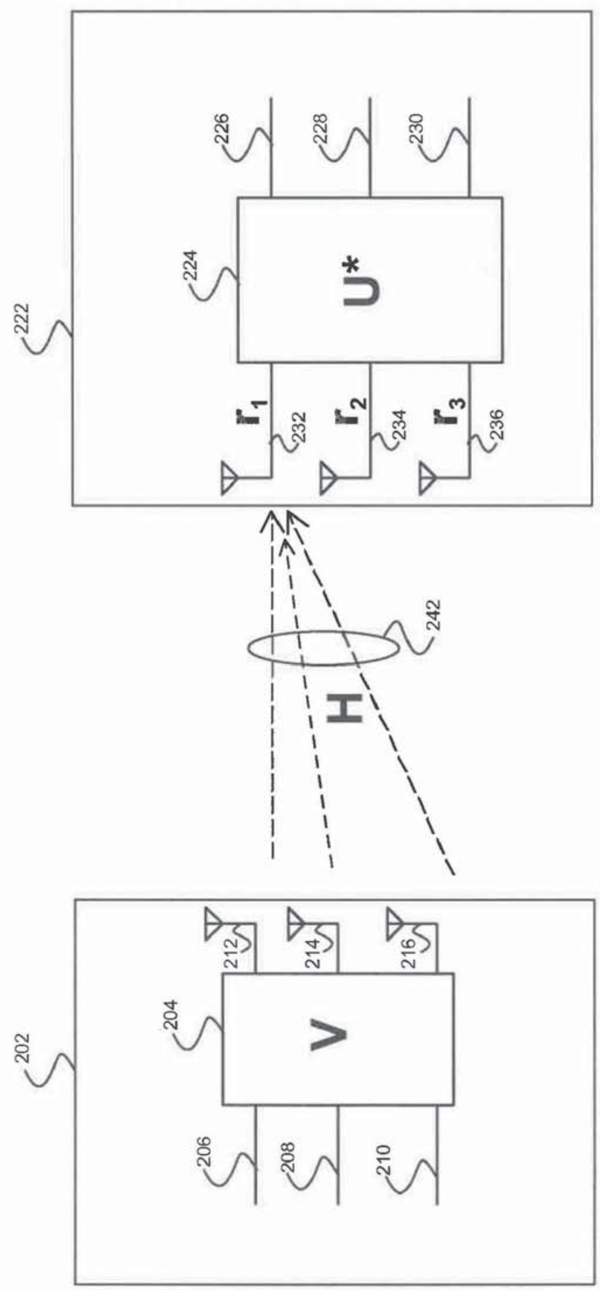
22 Claims, 9 Drawing Sheets





Coding Processor
Modulation
Mapping
Weighing
Weighing
Demapping
Demodulation
Decoding Processor
102
104
106
108
110
112
114
150
122
124
126
128
130
132
134

FIG. 1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V
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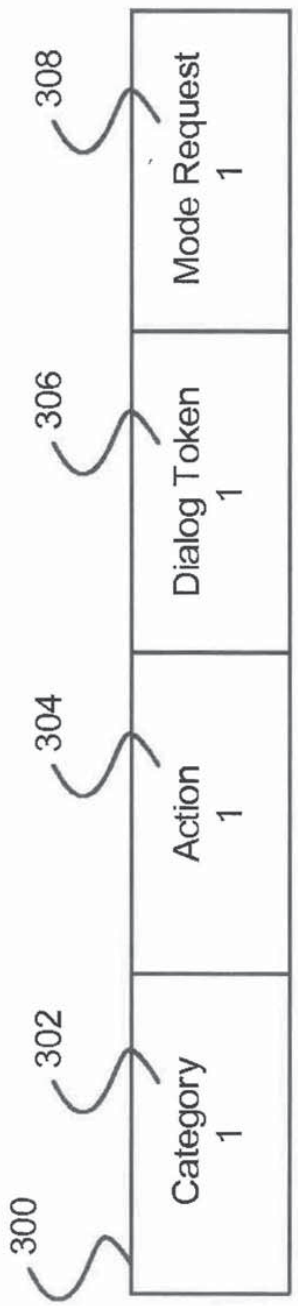
216

FIG. 2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Action
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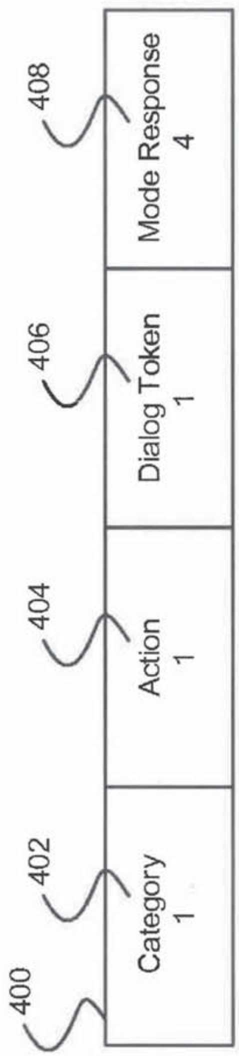
FIG. 3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Mode Response
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FIG. 4

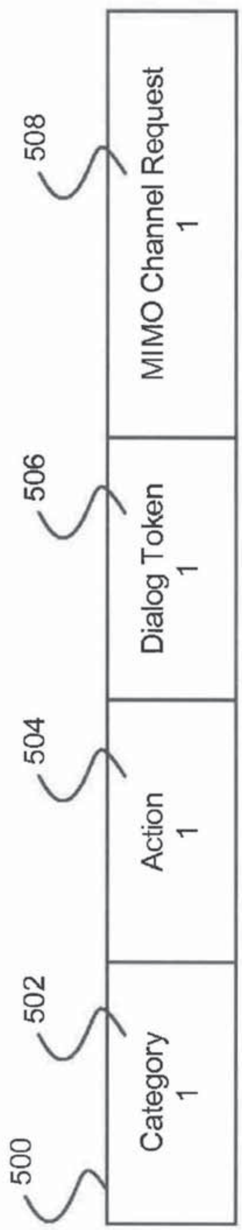
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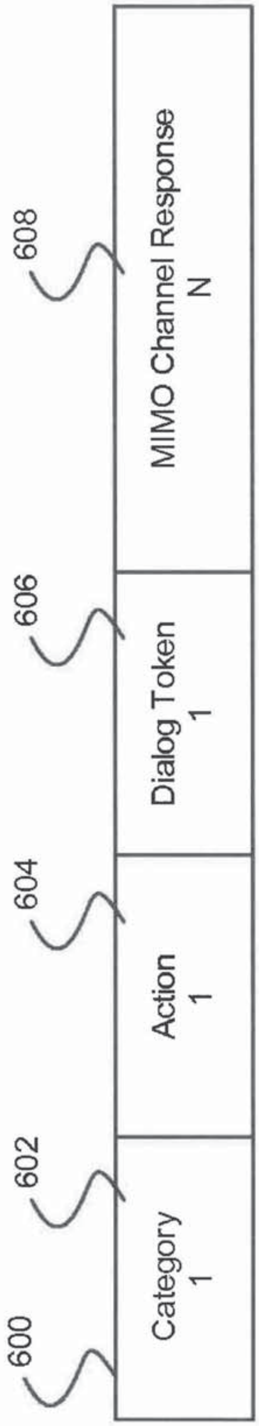
FIG. 5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604
606
608
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1
Action
1
Dialog Token
1
MIMO Channel Response
N

FIG. 6a

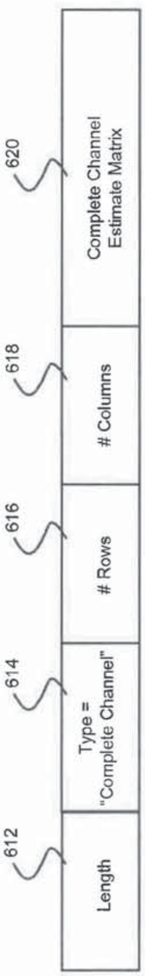

FIG. 6b

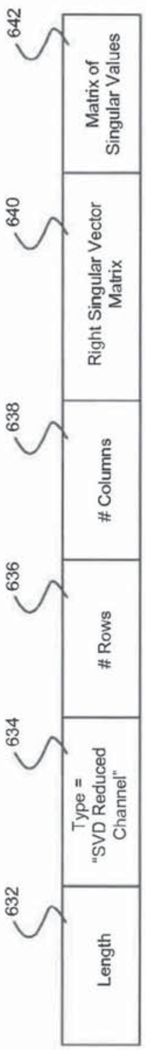

FIG. 6c

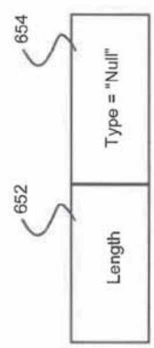

FIG. 6d

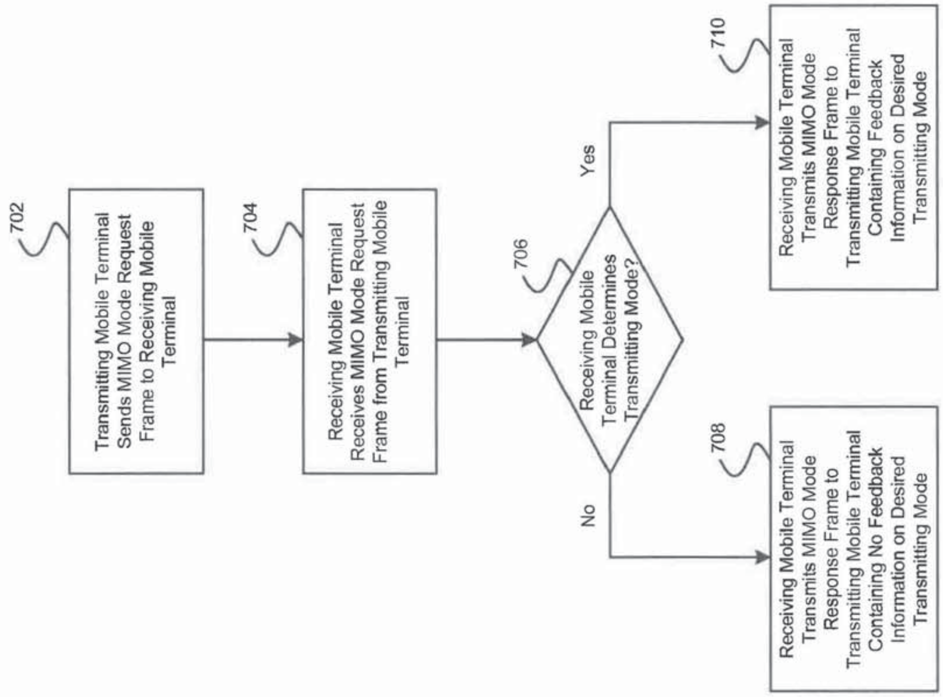
702
Transmitting Mobile Terminal Sends MIMO Mode Request Frame to Receiving Mobile Terminal
704
Receiving Mobile Terminal Receives MIMO Mode Request Frame from Transmitting Mobile Terminal
706
Receiving Mobile Terminal Determines Transmitting Mode?
Yes
No
710
Receiving Mobile Terminal Transmits MIMO Mode Response Frame to Transmitting Mobile Terminal Containing Feedback Information on Desired Transmitting Mode
708
Receiving Mobile Terminal Transmits MIMO Mode Response Frame to Transmitting Mobile Terminal Containing No Feedback Information on Desired Transmitting Mode

FIG. 7

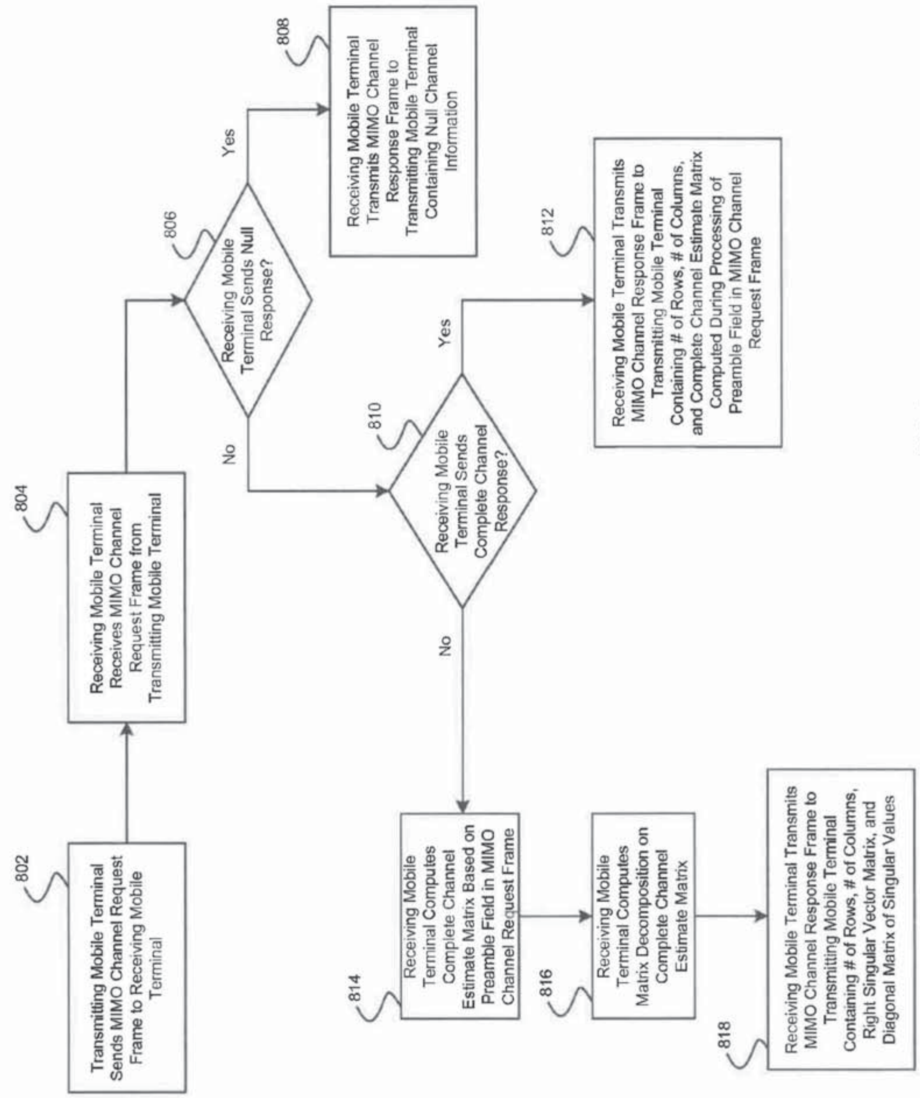

FIG. 8

APPX265

EXHIBIT G,

METHOD AND SYSTEM FOR FRAME FORMATS FOR MIMO CHANNEL MEASUREMENT EXCHANGE

CROSS-REFERENCE TO RELATED APPLICATIONS/INCORPORATION BY REFERENCE

This application is a continuation of U.S. application Ser. No. 11/052,353 filed Feb. 7, 2005, which claims the benefit of 60/636,255 filed Dec. 14, 2004.

This application makes reference to:

U.S. patent application Ser. No. 11/052,389 filed Feb. 7, 2005.

All of the above stated applications are hereby incorporated herein in their entirety.

FIELD OF THE INVENTION

Certain embodiments of the invention relate to wireless networking. More specifically, certain embodiments of the invention relate to a method and system for frame formats for MIMO channel measurement exchange.

BACKGROUND OF THE INVENTION

The Institute for Electrical and Electronics Engineers (IEEE), in resolution IEEE 802.11, also referred as "802.11", has defined a plurality of specifications which are related to wireless networking. Among them are specifications for "closed loop" feedback mechanisms by which a receiving mobile terminal may feed back information to a transmitting mobile terminal to assist the transmitting mobile terminal in adapting signals which are sent to the receiving mobile terminal.

Smart antenna systems combine multiple antenna elements with a signal processing capability to optimize the pattern of transmitted signal radiation and/or reception in response to the communications medium environment. The process of optimizing the pattern of radiation is sometimes referred to as "beamforming," which may utilize linear array mathematical operations to increase the average signal to noise ratio (SNR) by focusing energy in desired directions. In conventional smart antenna systems, only the transmitter or the receiver may be equipped with more than one antenna, and may typically be located in the base transceiver station (BTS) where the cost and space associated with smart antenna systems have been perceived as more easily affordable than on mobile terminals such as cellular telephones. Such systems are also known as multiple input single output (MISO) when a multiple antenna transmitter is transmitting signals to a single antenna receiver, or single input multiple output (SIMO) when a multiple antenna receiver is receiving signals that have been transmitted from a single antenna transmitter. With advances in digital signal processing (DSP) integrated circuits (ICs) in recent years, multiple antenna multiple output (MIMO) systems have emerged in which mobile terminals incorporate smart antenna systems comprising multiple transmit antenna and multiple receive antenna. One area of early adoption of MIMO systems has been in the field of wireless networking, particularly as applied to wireless local area networks (WLANs) where transmitting mobile terminals communicate with receiving mobile terminals. IEEE resolution 802.11 comprises specifications for communications between mobile terminals in WLAN systems.

Signal fading is a significant problem in wireless communications systems, often leading to temporary loss of communications at mobile terminals. One of the most pervasive forms of fading is known as multipath fading, in which dispersion of transmitted signals due to incident reflections from

buildings and other obstacles, results in multiple versions of the transmitted signals arriving at a receiving mobile terminal. The multiple versions of the transmitted signal may interfere with each other and may result in a reduced signal level detected at the receiving mobile terminal. When versions of the transmitted signal are 180° out of phase they may cancel each other such that a signal level of 0 is detected. Locations where this occurs may correspond to "dead zones" in which communication to the wireless terminal is temporarily lost. This type of fading is also known as "Rayleigh" or "flat" fading.

A transmitting mobile terminal may transmit data signals in which data is arranged as "symbols". The transmission of symbols may be constrained such that after a symbol is transmitted, a minimum period of time, T_s, must transpire before another symbol may be transmitted. After transmission of a symbol from a transmitting mobile terminal, some period of dispersion time, T_d, may transpire which may be the time over which the receiving mobile terminal is able to receive the symbol, including multipath reflections. The time T_d may not need to account for the arrival of all multipath reflections because interference from later arriving reflected signals may be negligible. If the period T_s is less than T_d there is a possibility that the receiving mobile terminal will start receiving a second symbol from the transmitting mobile terminal while it is still receiving the first symbol. This may result in intersymbol interference (ISI), producing distortion in received signals, and possibility resulting in a loss of information. The quantity $1/T_d$ is also referred to as the "coherence bandwidth" which may indicate the maximum rate at which symbols, and correspondingly information, may be transmitted via a given communications medium. One method to compensate for ISI in signals may entail utilizing DSP algorithms which perform adaptive equalization.

Another important type of fading is related to motion. When a transmitting mobile terminal, or a receiving mobile terminal is in motion, the Doppler phenomenon may affect the frequency of the received signal. The frequency of the received signal may be changed by an amount which is a function of the velocity at which a mobile terminal is moving. Because of the Doppler effect, ISI may result when a mobile terminal is in motion, particularly when the mobile terminal is moving at a high velocity. Intuitively, if a receiving mobile terminal is in motion and nearing a transmitting mobile terminal, the distance between the two mobile terminals will change as a function of time. As the distance is reduced, the propagation delay time, T_p, which is the time between when a transmitter first transmits a signal and when it first arrives at a receiver, is also reduced. As the mobile terminals become closer it is also possible that T_d may be increased if, for example, the transmitting mobile terminal does not reduce the radiated power of transmitted signals. If T_p becomes less than T_d, there may be ISI due to the Doppler effect. This case, which illustrates why data rates may be reduced for mobile terminals that are in motion, is referred to as "fast fading". Because fast fading may distort signals at some frequencies while not distorting signals at other frequencies, fast fading may also be referred to as "frequency selective" fading.

Smart antenna systems may transmit multiple versions of a signal in what is known as "spatial diversity". A key concept in spatial diversity is that the propagation of multiple versions of a signal, or "spatial stream", from different antenna may significantly reduce the probability of flat fading at the receiving mobile terminal since not all of the transmitted signals would have the same dead zone.

Current transmission schemes in MIMO systems typically fall into two categories: data rate maximization, and diversity maximization. Data rate maximization focuses on increasing the aggregate data transfer rate between a transmitting mobile terminal and a receiving mobile terminal by transmitting different spatial streams from different antenna. One method for increasing the data rate from a transmitting mobile terminal would be to decompose a high bit rate data stream into a plurality of lower bit rate data streams such that the aggregate bit rates among the plurality of lower bit rate data streams is equal to that of the high bit rate data stream. Next, each of the lower bit rate data streams may be mapped to at least one of the transmitting antenna for transmission. In addition, each signal comprising one of the lower bit rate data streams is multiplicatively scaled by a weighting factor prior to transmission. The plurality of multiplicative scale factors applied to the plurality of signals comprising the lower bit rate data streams may be utilized to form the transmitted "beam" in the beamforming technique. An example of a data rate maximization scheme is orthogonal frequency division multiplexing (OFDM), in which each of the plurality of signals is modulated by a different frequency carrier signal prior to mapping and multiplicative scaling. OFDM transmission may be resistant to multipath fading in that a portion, but most likely not all, of the data transmitted may be lost at any instant in time due to multipath fading.

Diversity maximization focuses on increasing the probability that a signal transmitted by a transmitting mobile terminal will be received at a receiving mobile terminal, and on increasing the SNR of received signals. In diversity maximization, multiple versions of the same signal may be transmitted by a plurality of antenna. The case in which a transmitting mobile terminal is transmitting the same signal via all of its transmitting antenna may be the pure spatial diversity case in which the aggregate data transfer rate may be equal to that of a single antenna mobile terminal. There is a plurality of hybrid adaptations of the data rate and spatial diversity maximization schemes which achieve varying data rates and spatial diversities.

MIMO systems employing beamforming may enable the simultaneous transmission of multiple signals occupying a shared frequency band, similar to what may be achieved in code division multiple access (CDMA) systems. For example, the multiplicative scaling of signals prior to transmission, and a similar multiplicative scaling of signals after reception, may enable a specific antenna at a receiving mobile terminal to receive a signal which had been transmitted by a specific antenna at the transmitting mobile terminal to the exclusion of signals which had been transmitted from other antenna. However, MIMO systems may not require the frequency spreading techniques used in CDMA transmission systems. Thus, MIMO systems may make more efficient utilization of frequency spectrum.

One of the challenges in beamforming is that the multiplicative scale factors which are applied to transmitted and received signals may be dependent upon the characteristics of the communications medium between the transmitting mobile terminal and the receiving mobile terminal. A communications medium, such as a radio frequency (RF) channel between a transmitting mobile terminal and a receiving mobile terminal, may be represented by a transfer system function, H. The relationship between a time varying transmitted signal, x(t), a time varying received signal, y(t), and the systems function may be represented as shown in equation [1]:

$$y(t)=H\times x(t)+n(t), \text{ where} \qquad \text{equation[1]}$$

n(t) represents noise which may be introduced as the signal travels through the communications medium and the receiver itself. In MIMO systems, the elements in equation[1] may be represented as vectors and matrices. If a transmitting mobile terminal comprises M transmitting antenna, and a receiving mobile terminal comprises N receiving antenna, then y(t) may be represented by a vector of dimensions Nx1, x(t) may be represented by a vector of dimensions Mx1, n(t) by a vector of dimensions Nx1, and H may be represented by a matrix of dimensions N×M. In the case of fast fading, the transfer function, H, may itself become time varying and may thus also become a function of time, H(t). Therefore, individual coefficients, $h_{ij}(t)$, in the transfer function H(t) may become time varying in nature.

In MIMO systems which communicate according to specifications in IEEE resolution 802.11, the receiving mobile terminal may compute H(t) each time a frame of information is received from a transmitting mobile terminal based upon the contents of a preamble field in each frame. The computations which are performed at the receiving mobile terminal may constitute an estimate of the "true" values of H(t) and may be known as "channel estimates". For a frequency selective channel there may be a set of H(t) coefficients for each tone that is transmitted via the RF channel. To the extent that H(t), which may be referred to as the "channel estimate matrix", changes with time and to the extent that the transmitting mobile terminal fails to adapt to those changes, information loss between the transmitting mobile terminal and the receiving mobile terminal may result.

Higher layer communications protocols, such as the transmission control protocol (TCP) may attempt to adapt to detected information losses, but such adaptations may be less than optimal and may result in slower information transfer rates. In the case of fast fading, the problem may actually reside at lower protocol layers, such as the physical (PHY) layer, and the media access control (MAC) layer. These protocol layers may be specified under IEEE 802.11 for WLAN systems. The method by which adaptations may be made at the PHY and MAC layers, however, may comprise a mechanism by which a receiving mobile terminal may provide feedback information to a transmitting mobile terminal based upon channel estimates which are computed at the receiving mobile terminal.

Existing closed loop receiver to transmitter mechanisms, also referred as "RX to TX feedback mechanisms", that exist under IEEE 802.11 include acknowledgement (ACK) frames, and transmit power control (TPC) requests and reports. The TPC mechanisms may allow a receiving mobile terminal to communicate information to a transmitting mobile terminal about the transmit power level that should be used, and the link margin at the receiving mobile terminal. The link margin may represent the amount of signal power that is being received, which is in excess of a minimum power required by the receiving mobile terminal to decode message information, or frames, that it receives.

A plurality of proposals is emerging for new feedback mechanisms as candidates for incorporation in IEEE resolution 802.11. Among the proposals for new feedback mechanisms are proposals from TGn (task group N) sync, which is a multi-industry group that is working to define proposals for next generation wireless networks which are to be submitted for inclusion in IEEE 802.11, and Qualcomm. The proposals may be based upon what may be referred to as a "sounding frame". The sounding frame method may comprise the transmitting of a plurality of long training sequences (LTSs) that match the number of transmitting antenna at the receiving mobile terminal. The sounding frame method may not utilize beamforming or cyclic delay diversity (CDD). In the sounding frame method, each antenna may transmit independent information.

The receiving mobile terminal may estimate a complete reverse channel estimate matrix, H_{up}, for the channel defined in an uplink direction from the receiving mobile terminal to the transmitting mobile terminal. This may require calibration with the transmitting mobile terminal where the transmitting mobile terminal determines the forward channel estimate matrix, H_{down}, for the channel defined in a downlink direction from the transmitting mobile terminal to the receiving mobile terminal. To compensate for possible differences between H_{up} and H_{down} the receiving mobile terminal may be required to receive H_{down} from the transmitting mobile terminal, and to report $H_{up}-H_{down}$ as feedback information. The TGn sync proposal may not currently define a calibration response. A channel estimate matrix may utilize 24 or more bits for each channel and for each tone, comprising 12 or more bits in an in-phase (I) component and 12 or more bits in a quadrature (Q) component.

According to the principle of channel reciprocity, the characteristics of the RF channel in the direction from the transmitting mobile terminal to the receiving mobile terminal may be the same as the characteristics of the RF channel in the direction from the receiving mobile terminal to the transmitting mobile terminal $H_{up}=H_{down}$. In actual practice, however, there may be differences in the electronic circuitry between the respective transmitting mobile terminal and receiving mobile terminal such that, in some cases, there may not be channel reciprocity. This may require that a calibration process be performed in which H_{up} and H_{down} are compared to reconcile differences between the channel estimate matrices. However, there may be limitations inherent in some calibration processes. For example, some proposals for new IEEE 802.11 feedback mechanisms may be limited to performing "diagonal calibrations". These methods may not be able to account for conditions in which there are differences in non-diagonal coefficients between H_{up} and H_{down}. These non-diagonal coefficient differences may be the result of complicated antenna couplings at the respective transmitting mobile terminal and/or receiving mobile terminal. Accordingly, it may be very difficult for a calibration process to correct for these couplings. The ability of a calibration technique to accurately characterize the RF channel at any instant in time may be dependent upon a plurality of dynamic factors such as, for example, temperature variations. Another limitation of calibration procedures is that it is not known for how long a calibration renders an accurate characterization of the RF channel. Thus, the required frequency at which the calibration technique must be performed may not be known.

Further limitations and disadvantages of conventional and traditional approaches will become apparent to one of skill in the art, through comparison of such systems with some aspects of the present invention as set forth in the remainder of the present application with reference to the drawings.

BRIEF SUMMARY OF THE INVENTION

Certain embodiments of the invention may be found in a method and system for MIMO channel measurement exchange. Aspects of a method for communicating information in a communication system may comprise transmitting data via a plurality of radio frequency (RF) channels utilizing a plurality of transmitting antenna, receiving feedback information via at least one of the plurality of RF channels, and modifying a transmission mode based on the feedback information. Feedback information may be requested utilizing at least one of the plurality of transmitting antenna via at least one of the plurality of RF channels. The number of transmitting antenna utilized during the transmitting of data may be modified based on the feedback information. The transmission characteristics of data transmitted via at least one of the plurality of transmitting antenna may be modified based on the feedback information. Specific feedback information may be requested in request messages.

The method may further comprise negotiating a transmission mode for the transmitting of data via at least one of the plurality of RF channels. Aspects of the method may further comprise receiving feedback information comprising channel estimates based on the transmission characteristics of the data transmitted by at least one of the plurality of transmitting antenna. Feedback information may be derived from mathematical matrix decomposition of the channel estimates. Furthermore, feedback information may be derived from mathematical averaging of the result of mathematical matrix decomposition of the channel estimates. Feedback information may also be derived from a calibration of the channel estimates for communication in at least one direction via at least one of the plurality of RF channels.

In another embodiment of the invention a method for communicating information in a communication system may comprise receiving data via a plurality of RF channels utilizing a plurality of receiving antenna, transmitting feedback information via at least one of the plurality of RF channels, and requesting modification of the transmission mode for received data in transmitted response messages comprising the feedback information. Requests for feedback information may be received utilizing at least one of the plurality of receiving antenna via at least one of the plurality of RF channels. There may be requests for modification in the number of transmitting antenna utilized during transmission of received data in the transmitted response messages comprising the feedback information. There may be requests for modification in the transmission characteristics of data received via at least one of the plurality of receiving antenna in the transmitted response messages comprising the feedback information. The response messages may comprise the feedback information requested in the request messages.

The method may further comprise negotiating the transmission mode for the data received via at least one of the plurality of RF channels. Aspects of the method may further comprise transmitting feedback information comprising channel estimates based on the transmission characteristics of the data received via at least one of the plurality of receiving antenna. Feedback information may be derived from mathematical matrix decomposition of the channel estimates. Furthermore, feedback information may be derived from mathematical averaging of the result of mathematical matrix decomposition of the channel estimates. Feedback information may also be derived from a calibration of the channel estimates for communication in at least one direction via at least one of the plurality of RF channels.

Certain aspects of a system for communicating information in a communication system may comprise a transmitter that transmits data via a plurality of RF channels utilizing a plurality of transmitting antenna, with the transmitter receiving feedback information via at least one of the plurality of RF channels, and with the transmitter modifying a transmission mode based on the feedback information. The transmitter may request feedback information utilizing at least one of the plurality of transmitting antenna via at least one of the plurality of RF channels. The number of transmitting antenna utilized during the transmitting of data may be modified based on the feedback information. The transmission characteristics of data transmitted via at least one of the plurality of transmitting antenna may be modified based on the feedback information. The transmitter may request specific feedback information in request messages.

The system may further comprise the transmitter negotiating a transmission mode for the transmitting of data via at least one of the plurality of RF channels. Aspects of the system may further comprise receiving feedback information comprising channel estimates based on the transmission characteristics of the data transmitted by at least one of the plurality of transmitting antenna. Feedback information may be derived from mathematical matrix decomposition of the channel estimates. Furthermore, feedback information may be derived from mathematical averaging of the result of mathematical matrix decomposition of the channel estimates. Feedback information may also be derived from a calibration of the channel estimates for communication in at least one direction via at least one of the plurality of RF channels.

These and other advantages, aspects and novel features of the present invention, as well as details of an illustrated embodiment thereof, will be more fully understood from the following description and drawings.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is an exemplary diagram illustrating wireless communication between two mobile terminals in accordance with an embodiment of the invention.

FIG. **2** is an exemplary diagram illustrating Eigen beamforming in accordance with an embodiment of the invention.

FIG. **3** is an exemplary diagram illustrating the MIMO mode request frame in accordance with an embodiment of the invention.

FIG. **4** is an exemplary diagram illustrating the MIMO mode response frame in accordance with an embodiment of the invention.

FIG. **5** is an exemplary diagram illustrating the MIMO channel request frame in accordance with an embodiment of the invention.

FIG. **6***a* is an exemplary diagram illustrating the MIMO channel response frame in accordance with an embodiment of the invention.

FIG. **6***b* is an exemplary diagram illustrating the MIMO channel response field for type="Complete Channel" in accordance with an embodiment of the invention.

FIG. **6***c* is an exemplary diagram illustrating the MIMO channel response field for type="SVD Reduced Channel" in accordance with an embodiment of the invention.

FIG. **6***d* is an exemplary diagram illustrating the MIMO channel response field for type="Null" in accordance with an embodiment of the invention.

FIG. **7** is an exemplary flowchart illustrating steps in the exchange of RX/TX feedback information utilizing MIMO mode request and MIMO mode response frames in accordance with an embodiment of the invention.

FIG. **8** is an exemplary flowchart illustrating steps in the exchange of RX/TX feedback information utilizing MIMO channel request and MIMO channel response frames in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Certain embodiments of the invention may be found in a method and system for MIMO channel measurement exchange. There are options to conventional methods of RX/TX feedback mechanisms and to other proposals for new RX/TX feedback mechanisms. In one embodiment of the invention, a receiving mobile terminal may periodically transmit feedback information, comprising a channel estimate matrix, H_{up}, to a transmitting mobile terminal. In another embodiment of the invention, a receiving mobile terminal may perform a singular value decomposition (SVD) on the channel estimate matrix, and subsequently transmit SVD-derived feedback information to the transmitting mobile terminal. Utilizing SVD may increase the amount of computation required at the receiving mobile terminal but may reduce the quantity of information which is transmitted to the transmitting mobile terminal via the RF channel in comparison to transmitting the entire channel estimate matrix. Yet another embodiment of the invention may expand upon the method utilizing sounding frames to incorporate calibration. In this aspect of the invention, a receiving mobile terminal, after transmitting a sounding frame, may subsequently receive a channel estimate matrix, H_{down}, from the transmitting mobile terminal. The receiving mobile terminal may then transmit feedback information which is based upon the difference $H_{up}-H_{down}$, to the transmitting mobile terminal.

One embodiment of the invention may comprise a MIMO channel probe and response method, which may provide a flexible solution for RX/TX feedback because it may support a plurality of feedback mechanisms. In this regard, a transmitting mobile terminal may query a receiving mobile terminal to provide feedback information about the transmit mode configuration to use. The transmitting mobile terminal may receive feedback information comprising a full channel estimate matrix as computed by a receiving mobile terminal. Alternatively, the transmitting mobile terminal may receive feedback information comprising decomposition matrices that were derived from a full channel estimate matrix, or the transmitting mobile terminal may receive feedback information comprising matrices which contain averaged values derived from the decomposition matrices. Furthermore, the transmitting mobile terminal may receive feedback information which may be utilized in a calibration procedure.

RX/TX feedback mechanisms may be required to achieve high information transfer rates even in fast fading RF channels. In fast fading RF channels, however, the channel estimate matrix H(t) may change rapidly. Thus, the amount of feedback information that is required may also increase. Transmission of a large quantity of RT/TX feedback information may create excessive overhead on the RF channel and may reduce the available rate at which other information transfer may occur via the RF channel.

SVD is a method which may reduce the quantity of channel feedback information which is transmitted between a receiving mobile terminal and a transmitting mobile terminal. U.S. application Ser. No. 11/052,389 describes SVD and is hereby incorporated by reference herein in its entirety. When computing the SVD a plurality of techniques may be utilized in performing SVD reduction on the full channel estimate matrix. In one embodiment of the invention, a full channel estimate matrix which is computed by a receiving mobile terminal, H_{est}, may be represented by its SVD:

$$H_{est}=USV^H, \text{ where} \quad \text{equation[2]}$$

H_{est} may be a complex matrix of dimensions $N_{rx}\times N_{tx}$, where N_{rx} may be equal to the number of receive antenna at the receiving mobile terminal, and N_{tx} may be equal to the number of transmit antenna at the transmitting mobile terminal, U may be an orthonormal complex matrix of dimensions $N_{rx}\cdot N_{rx}$, S may be a diagonal real matrix of dimensions $N_{rx}\times N_{tx}$, and V may be an orthonormal complex matrix of dimensions $N_{tx}\times N_{tx}$ with V^H being the Hermitian transform of the matrix V. The singular values in the matrix S may represent the square roots of the Eigenvalues for the matrix H_{est}, U may represent the left singular vectors for the matrix H_{est} where the columns of U may be the Eigenvectors of the matrix product $H_{est}H_{est}^H$, and V^H may represent the right singular vectors for the matrix H_{est} where the columns of V may be the Eigenvectors of the matrix product $H_{est}^H H_{est}$.

If we define a square $N_{tx}\times N_{tx}$ matrix, $W=H_{est}^H H_{est}$, then for any given Eigenvalue of H_{est}, λ, the following relationship may exist for a nonzero vector, R:

$$WR=\lambda R \qquad \text{equation[3]}$$

From which it follows:

$$(H_{est}^H H_{est}-\lambda I)R=0, \text{ where} \qquad \text{equation[4]}$$

I may be the identity matrix.

Solving equation[4], which may also be known as a "characteristic equation", may produce a set of Eigenvalues. By using each of these Eigenvalues iteratively in equation[4], a series of Eigenvectors, R, may be derived. The series of Eigenvectors, R, may form the columns of the matrix V.

Since $H_{est}^H H_{est}=VS^2V^H$, given a matrix of Eigenvectors, V, and a diagonal matrix of Eigenvalues, S, a matrix H_{est} may be derived. Therefore, the channel estimate matrix H_{est} from the SVD in equation[2] may be reconstructed by a transmitting mobile terminal from feedback information which contains V^H and S only. Since N_{rx} may be greater than N_{tx}, the quantity of information contained in matrices V^H and S may be less than that contained in the matrix H_{est}. In an embodiment of the invention, each of the complex coefficients of the V^H matrix may be encoded utilizing, for example, a signed 12-bit integer for an I component, and a signed 12-bit integer for a Q component. Each of the nonzero diagonal real coefficients of the S matrix may be encoded as, for example, IEEE 32-bit floating point numbers.

For an RF channel, H_{est} may be different for tones of different frequencies that are transmitted via the RF channel. Thus, a plurality of channel estimate matrices, H_{est}, may be computed to account for each tone which may be transmitted via the RF channel. In another embodiment of the invention, a further reduction in the quantity of information that is transmitted in feedback information may be achieved by computing a plurality of SVD on H_{est} as in equation[2], and averaging the coefficient values in matrices V^H and S over a plurality of tones. In one aspect of the invention, if M tones are transmitted via the RF channel, an adaptive modulation technique may be utilized, for example, and a diagonal matrix D derived based upon an average of the individual matrices S_i that are derived from each of the tones:

$$D=\frac{1}{M}\times\sum_{i=1}^{M}S_i \qquad \text{equation[5]}$$

Adaptive modulation may limit the representation of each nonzero coefficient in the diagonal matrix, d_{ii} to 8 bits per averaged tone. Thus by replacing the plurality of matrices S_i with the matrix D, the quantity of singular value matrix information which is transmitted in feedback information may be reduced by a factor of 4M.

A plurality of L matrices, $Avg_k(V^H)$, may be derived by averaging the coefficients from the matrices V^H in groups of 6 tones. Furthermore, the matrix of complex coefficient average values may be represented in the form:

$$Avg^k(V(f)^H)=|Avg^k(V(f)^H)|e^{j\phi}, \text{ where} \qquad \text{equation [6]}$$

$V(f)^H$ expresses V^H as a function of frequency, $|Avg^k(V(f)^H)|$ may represent the magnitude of the average of the I and Q components among the plurality of 6 $V(f)^H$ matrices whose coefficients are averaged in a group, and ϕ may represent the phase of the corresponding I and Q components, the index k may indicate an individual matrix of averaged values of V^H, and L may equal M/6. In an exemplary embodiment of the invention, the magnitude $|Avg^k(V(f)^H)|$ may be represented as a 6-bit integer, and the phase ϕ may be represented as a 4-bit integer. By replacing the plurality of M matrices, V^H, with a plurality of L matrices $Avg(V(f)^H)$, the quantity of singular vector information which is transmitted in feedback information may be reduced by a factor of $6\times(24/10)$.

The invention is not limited to an average of singular values as expressed in equation[5] and the invention is not limited to expressing the average as an 8-bit binary data entity. Similarly, the invention as expressed in equation[6] is not limited to computing averages in groups of 6 tones, and the invention is not limited to expressing the magnitudes of the averages as 6-bit integers and the phases of the averages as 4-bit integers. Other possibilities exist and are contemplated as falling within the scope of the present invention.

In another embodiment of the invention, a calibration procedure may be performed between the transmitting mobile terminal and the receiving mobile terminal. In this case, the transmitting mobile terminal may compute a full channel estimate matrix, H_{down}. The transmitting mobile terminal may transmit H_{down} to the receiving mobile terminal. The receiving mobile terminal may then perform an SVD on H_{down} to derive matrices, S_{down}, and V_{down}^H based on the setting of U_{down} equal to the value of U that is derived from H_{est} in equation[2]. Furthermore, the receiving mobile terminal may derive D_{down} and $Avg^k(V_{down}(f)^H)$. The receiving mobile terminal may perform calibration by comparing the matrix D_{down} to the matrix D as derived in equation[5]:

$$D_\Delta=D_{down}-D \qquad \text{equation[7]}$$

and by comparing the plurality of matrices $Avg^k(V_{down}(f)^H)$ to the plurality of matrices $Avg^k(V(f)^H)$ as derived in equation [6]:

$$Avg^k(V_\Delta)=Avg^k(V_{down}(f)^H)-Avg^k(V(f)^H) \qquad \text{equation[8]}$$

If $Avg^k(V_\Delta)$ is equal to 0 for all values k=1, ... L, then the SVD from equation[2] may be reconstructed at the transmitting mobile terminal by sending the matrix D_A only. If $Avg^k(V_\Delta)$ is not equal to 0 for all values k=1, ... L, then the SVD from equation[2] may be reconstructed at the transmitting mobile terminal by sending the matrix D_Δ and the plurality of nonzero coefficients from the matrices $Avg^k(V_\Delta)$.

FIG. **1** is an exemplary diagram illustrating wireless communication between two mobile terminals in accordance with an embodiment of the invention. Referring to FIG. **1** there is shown a first mobile terminal **102**, a second mobile terminal **122** and a radio frequency (RF) communication channel **150**. An example of a standard method by which a first mobile terminal **102** and a second mobile terminal **122** may communicate via an RF channel **150** may be defined in IEEE resolution 802.11n. A plurality of different frequencies may be utilized to communicate via the RF channel **150** and one or more frequencies may be utilized to communicate information between the first mobile terminal **102** and a second mobile terminal **122**.

The first mobile terminal **102** may further comprise a coding processor **104**, a modulation block **106**, a mapping block **108**, a weighing block **110**, and one or more antenna such as the plurality of antenna **112**, . . . **114**. The second mobile terminal **122** may further comprise one or more antenna such as the plurality of antenna **124**, . . . **126**, a weighing block **128**, a demapping block **130**, a demodulation block **132**, and a decoding processor **134**.

The coding processor **104** may comprise suitable logic, circuitry and/or code that may be adapted to perform coding on information which is to be transmitted by the transmitting mobile terminal such as, for example, binary convolutional coding (BCC). The modulation block **106** may comprise suitable logic, circuitry and/or code that may be adapted to modulate baseband information into one or more RF signals. The mapping block **108** may comprise suitable logic, circuitry and/or code that may be adapted to assign an RF signal for transmission via one or more antenna **112**, . . . **114**. The weighing block **110** may comprise suitable logic, circuitry and/or code that may be adapted to assign scale factors, or weights, to individual RF signals for transmission via one or more antenna **112**, . . . **114**.

In the second mobile terminal **122**, one or more antenna **124**, . . . **126** may receive information from the first mobile terminal **102** via one or more frequencies over the RF communication channel **150**. The weighing block **128** may comprise suitable logic, circuitry and/or code that may be utilized to assign weights to individual RF signals received via one or more antenna **124**, . . . **126**. The demapping block **130** may comprise suitable logic, circuitry and/or code that may be utilized to reconcile a set of RF signals received from one or more antenna **124**, . . . **126** into another set of one or more RF signals. The demodulation block **132** may comprise suitable logic, circuitry and/or code that may be adapted to demodulate one or more RF signals into one or more baseband signals. The decoding processor **134** may comprise suitable logic, circuitry and/or code that may be adapted to perform decoding of information received from one or more antenna **124**, . . . **126** into, for example, binary information.

FIG. **2** is an exemplary diagram illustrating Eigen beamforming in accordance with an embodiment of the invention. Referring to FIG. **2** there is shown a transmitting mobile terminal **202**, a receiving mobile terminal **222**, and a plurality of RF channels **242**. The transmitting mobile terminal **202** comprises a transmit filter coefficient block V **204**, a first source signal s_1 **206**, a second source signal s_2 **208**, a third source signal s_3 **210**, and a plurality of transmitting antenna **212**, **214**, and **216**.

In operation, the transmitting antenna **212** may be adapted to transmit a signal x_1, the transmitting antenna **214** may transmit a signal x_2, and the transmitting antenna **216** may transmit a signal x_3. In beamforming each transmitted signal x_1, x_2, and x_3 may be a function of a weighted summation of at least one of the plurality of the source signals s_1, s_2, and s_3. The weights may be determined by the transmit filter coefficient block V such that:

$$X=VS, \text{ where} \qquad \text{equation[9]}$$

S may be represented by, for example, a 3×1 matrix $\{s_1, s_2, s_3\}$, and X may be represented by, for example, a 3×1 matrix $\{x_1, x_2, x_3\}$. Accordingly, V may be represented as a 3×3 matrix $\{\{v_{11},v_{12},v_{13}\}\{v_{21},v_{22},v_{23}\}\{v_{31},v_{32},v_{33}\}\}$.

The receiving mobile terminal **222** comprises a receive filter coefficient block U* **224**, a first destination signal $\tilde{y}_1$ **226**, a second destination signal $\tilde{y}_2$ **228**, a third destination signal $\tilde{y}_3$ **230**, and a plurality of receiving antenna **232**, **234**, and **236**. The receiving antenna **232** may be adapted to receive a signal y_1, the receiving antenna **234** may receive a signal y_2, and the receiving antenna **236** may receive a signal y_3. The characteristics of the plurality of RF channels **242** utilized for communication between the transmitting mobile terminal **202**, and the receiving mobile terminal **222** may be represented mathematically by a transfer coefficient matrix H.

FIG. **3** is an exemplary diagram illustrating the MIMO mode request frame in accordance with an embodiment of the invention. Referring to FIG. **3** there is shown a MIMO mode request frame **300**, which comprises a category field **302**, an action field **304**, a dialog token field **306**, and a mode request field **308**. The category field **302** may comprise 1 octet of binary data, for example, which may identify the general category of the frame within the wider context of all frames which are defined in IEEE 802.11. The category field **302** may be set to a specific value to identify the category which is defined for the MIMO mode request frame. The action field **304** may comprise 1 octet of binary data, for example, which may identify the frame type. The action field **304** may be set to a specific value to identify a MIMO mode request frame. The dialog token field **306** may comprise 1 octet of binary data, for example, which may identify a particular MIMO mode request frame. This field may be utilized to identify a specific MIMO mode request frame in the event that a transmitting mobile terminal **202** has transmitted a plurality of MIMO mode request frames, such as may be the case if a transmitting mobile terminal **202** were communicating with a plurality of receiving mobile terminals **222**.

The mode request field **308** may comprise 1 octet of binary data, for example, which may identify the function which is to be performed by the mobile terminal that receives the MIMO mode request frame. The mode request field **308** may be set to a specific value to indicate that feedback information about the transmit mode to be utilized when transmitting to a receiving mobile terminal **222** is being requested by the transmitting mobile terminal **202**. The mode request field **308** may also comprise information which indicates capabilities of the transmitting mobile terminal **202**. A receiving mobile terminal **222** that receives the MIMO mode request frame may use information about capabilities of the transmitting mobile terminal **202** in providing feedback information to the transmitting mobile terminal **202** in response to the MIMO mode request frame.

The MIMO mode request frame **300** may be transmitted by a transmitting mobile terminal **202** to a receiving mobile terminal **222** via an RF channel **242** to request that the receiving mobile terminal **222** provide feedback information about the transmit mode that the transmitting mobile terminal **202** should use when transmitting information to the receiving mobile terminal **222** via the RF channel **242**.

FIG. **4** is an exemplary diagram illustrating the MIMO mode response frame in accordance with an embodiment of the invention. Referring to FIG. **4** there is shown a MIMO mode response frame **400**, which comprises a category field **402**, an action field **404**, a dialog token field **406**, and a mode response field **408**. The category field **402** may comprise 1 octet of binary data, for example, which may identify the general category of the frame within the wider context of all frames which are defined in IEEE 802.11. The category field **402** may be set to a specific value to identify the category which is defined for the MIMO mode response frame. The action field **404** may comprise 1 octet of binary data, for example, which may identify the frame type. The action field **404** may be set to a specific value to identify a MIMO mode response frame. The dialog token field **406** may comprise 1 octet of binary data, for example, which may identify a particular MIMO mode response frame. This field may be utilized to identify a specific MIMO mode response frame to a transmitting mobile terminal **202**.

The mode response field **408** may comprise feedback information, which may be fed back in response to a previous MIMO mode request frame. The mode response field **408** may comprise 4 octets of binary data, for example. The mode response field **408** may comprise feedback information pertaining to a number of spatial streams that a transmitting mobile terminal **202** may utilize when transmitting to a receiving mobile terminal **222**, a number of transmit antenna that a transmitting mobile terminal **202** may utilize, and bandwidth that may be utilized by a transmitting mobile terminal **202**. In addition, the mode response field **408** may comprise feedback information about a code rate to use for information transmitted by a transmitting mobile terminal **202**, an error correcting code type to use, and a type of modulation to use for information transmitted by a transmitting mobile terminal **202** to a receiving mobile terminal **222**. A receiving mobile terminal **222** may indicate a null response in the mode request field **408** to indicate, for example, that the receiving mobile terminal **222** is unable to determine a requested transmit mode in response to a MIMO mode request frame **300**.

The MIMO mode response frame **400** may be transmitted by a receiving mobile terminal **222** to a transmitting mobile terminal **202** in response to a previous MIMO mode request frame **300** to provide feedback information about the transmit mode that the transmitting mobile terminal **202** should use when transmitting information to the receiving mobile terminal **222** via the RF channel **242**.

In an embodiment of the invention with reference to FIGS. **2-4**, the transmitting mobile terminal **202** may transmit a MIMO mode request frame **300** to a receiving mobile terminal **222**. In the MIMO mode request frame **300** an integer value, seq, may be contained in the dialog token field **306** of the MIMO mode request frame **300**. If the receiving mobile terminal **222** incorporates the value, seq, in the dialog token field **406** in the MIMO mode response frame **400**, the transmitting mobile terminal **202** which receives the MIMO mode response frame **400** may be able to identify the frame as being the response to the MIMO mode request frame **300** that had been sent previously by the transmitting mobile terminal **202** to the receiving mobile terminal **222**.

In another embodiment of the invention, the transmitting mobile terminal **202** may transmit a first MIMO mode request frame **300** to a first receiving mobile terminal **222**. The transmitting mobile terminal **202** may then transmit a second MIMO mode request frame to a second receiving mobile terminal. In the first MIMO mode request frame an integer value, seq1, may be contained in the dialog token field **306** of the MIMO mode request frame **300**. In the second MIMO mode request frame an integer value, seq2, may be contained in the dialog token field **306** of the MIMO mode request frame **300**. If the first receiving mobile terminal **222** incorporates the value, seq1, in the dialog token field **406** in the MIMO mode response frame **400**, the transmitting mobile terminal **202** which receives the MIMO mode response frame **400** may be able to identify the frame as being the response to the first MIMO mode request frame **300** that had been sent previously by the transmitting mobile terminal **202** to the first receiving mobile terminal **222**. If the second receiving mobile terminal **222** incorporates the value, seq2, in the dialog token field **406** in the MIMO mode response frame **400**, the transmitting mobile terminal **202** which receives the MIMO mode response frame **400** may be able to identify the frame as being the response that corresponds to the second MIMO mode request frame **300** that had been sent previously by the transmitting mobile terminal **202** to the second receiving mobile terminal.

Any individual field in either the MIMO mode request frame **300** or the MIMO mode response frame **400** may comprise a plurality of octets of binary data. The MIMO mode request frame **300**, the MIMO mode response frame **400**, and any individual field in either the MIMO mode request frame **300** or the MIMO mode response frame **400** may be of variable length. The MIMO mode request frame **300** or the MIMO mode response frame **400** may comprise information which indicates the length of the respective frame. The MIMO mode request frame **300** or the MIMO mode response frame **400** may comprise information which indicates the length of any fields contained within the respective frame. The MIMO mode request frame **300** and the MIMO mode response frame **400** may comprise other information which enable a receiving mobile terminal **222** and a transmitting mobile terminal **202** to negotiate a transmission mode for a common RF channel.

FIG. **5** is an exemplary diagram illustrating the MIMO channel request frame in accordance with an embodiment of the invention. Referring to FIG. **5** there is shown a MIMO channel request frame **500**, which comprises a category field **502**, an action field **504**, a dialog token field **506**, and a MIMO channel request field **508**. The category field **502** may comprise 1 octet of binary data, for example, which may identify the general category of the frame within the wider context of all frames which are defined in IEEE 802.11. The category field **502** may be set to a specific value to identify the category which is defined for the MIMO channel request frame. The action field **504** may comprise 1 octet of binary data, for example, which may identify the frame type. The action field **504** may be set to a specific value to identify a MIMO channel request frame. The dialog token field **506** may comprise 1 octet of binary data, for example, which may identify a particular MIMO channel request frame. This field may be utilized to identify a specific MIMO channel request frame in the event that a transmitting mobile terminal **202** has transmitted a plurality of MIMO channel request frames, such as may be the case if a transmitting mobile terminal **202** were communicating with a plurality of receiving mobile terminals **222**.

The MIMO channel request frame **500** may be transmitted by a transmitting mobile terminal **202** to a receiving mobile terminal **222** via an RF channel **242** to request that the receiving mobile terminal **222** provide feedback information about the channel estimates that the receiving mobile terminal **222** has computed for the RF channel **242**.

The MIMO channel request field **508** may comprise 1 octet of binary data, for example, which may identify the function which is to be performed by the mobile terminal that receives the MIMO channel request frame. The channel request field **508** may be set to a specific value to indicate that feedback information about the channel estimates that the receiving mobile terminal **222** has computed for the RF channel **242** is being requested by the transmitting mobile terminal **202**. The MIMO channel request field **508** may also comprise information from the channel estimation matrix, H_{down}, which is computed at the transmitting mobile terminal **202**. A receiving mobile terminal **222** that receives the MIMO channel request frame may use H_{down} information from the transmitting mobile terminal **202** to perform calibration.

FIG. **6a** is an exemplary diagram illustrating the MIMO channel response frame in accordance with an embodiment of the invention. Referring to FIG. **6a** there is shown a MIMO channel response frame **600**, which comprises a category field **602**, an action field **604**, a dialog token field **606**, and a MIMO channel response field **608**. The category field **602** may comprise 1 octet of binary data, for example, which may identify the general category of the frame within the wider context of all frames which are defined in IEEE 802.11. The category field **602** may be set to a specific value to identify the category which is defined for the MIMO channel response frame. The action field **604** may comprise 1 octet of binary data, for example, which may identify the frame type. The action field **604** may be set to a specific value to identify a MIMO channel response frame. The dialog token field **606** may comprise 1 octet of binary data, for example, which may identify a particular MIMO channel response frame. This field may be utilized to identify a specific MIMO channel response frame to a transmitting mobile terminal **202**.

The MIMO channel response field **608** may comprise a variable number of octets of binary data, for example, which may comprise feedback information in response to a previous MIMO channel request frame. FIG. **6***b* is an exemplary diagram illustrating the MIMO channel response field for type="complete channel" in accordance with an embodiment of the invention. The length subfield **612** within the MIMO channel response field **608** may comprise 2 octets of binary data, for example, which may comprise information which indicates the length of the MIMO channel response field **608**. The type subfield **614** within the MIMO channel response field may comprise 1 octet of binary data, for example, which may comprise information that indicates the feedback information which is contained the MIMO channel response field **608**. In FIG. **6***b* the feedback information type is shown to indicate "complete channel". Subfield **616** within the MIMO channel response field **608** may comprise 1 octet of binary data, for example, which may comprise an indication of the number of rows in the matrix of feedback information which is contained in the MIMO channel response field **608**. Subfield **618** within the MIMO channel response field **608** may comprise 1 octet of binary data, for example, which may comprise an indication of the number of columns in the matrix of feedback information which is contained in the MIMO channel response field **608**. Subfield **620** within the MIMO channel response field **608** may comprise a variable number of octets based upon the contents of subfields **616** and **618**, for example, which may comprise the complete channel estimate matrix which was computed during processing of the preceding MIMO channel request frame **500**.

FIG. **6***c* is an exemplary diagram illustrating the MIMO channel response field for type="SVD Reduced Channel" in accordance with an embodiment of the invention. The length subfield **632** within the MIMO channel response field **608** may comprise 2 octets of binary data, for example, which may comprise information which indicates the length of the MIMO channel response field **608**. The type subfield **634** within the MIMO channel response field may comprise 1 octet of binary data, for example, which may comprise information that indicates the feedback information which is contained the MIMO channel response field **608**. In FIG. **6***c* the feedback information type is shown to indicate "SVD reduced channel". Subfield **636** within the MIMO channel response field **608** may comprise 1 octet of binary data, for example, which may comprise an indication of the number of rows in the matrix of feedback information which is contained in the MIMO channel response field **608**. Subfield **638** within the MIMO channel response field **608** may comprise 1 octet of binary data, for example, which may comprise an indication of the number of columns in the matrix of feedback information which is contained in the MIMO channel response field **608**. Subfield **640** within the MIMO channel response field **608** may comprise a variable number of octets based upon the contents of subfields **636** and **638**, for example, which may comprise the right singular vector matrix, V. Subfield **642** within the MIMO channel response field **608** may comprise a variable number of octets based upon the contents of subfields **636** and **638**, for example, which may comprise the diagonal matrix of singular values, S. The matrices V and S may be derived from the complete channel estimate matrix which was computed during the processing of the preceding MIMO channel request frame **500**.

FIG. **6***d* is an exemplary diagram illustrating the MIMO channel response field for type="Null" in accordance with an embodiment of the invention. The length subfield **652** within the MIMO channel response field **608** may comprise 2 octets of binary data, for example, which may comprise information which indicates the length of the MIMO channel response field **608**. The type subfield **654** within the MIMO channel response field may comprise 1 octet of binary data, for example, which may comprise information that indicates the feedback information which is contained the MIMO channel response field **608**. In FIG. **6***d* the feedback information type is shown to indicate "Null". If the feedback information type is "null", the receiving mobile terminal **222** may not have been able to compute a channel estimate, in which case the MIMO channel response field **608** may not comprise feedback information.

The MIMO channel response frame **600** may be transmitted by a receiving mobile terminal **222** to a transmitting mobile terminal **202** in response to a previous MIMO channel request frame **500** to provide feedback information about the channel estimates that the receiving mobile terminal **222** has computed for the RF channel **242**.

If the quantity of data from SVD derived matrices are further reduced by averaging, the MIMO channel response field **608** may comprise an indication of the number of rows in the matrices which are contained in the MIMO channel response field **608**, an indication of the number of columns in the matrices which are contained in the MIMO channel response field, the matrix D as derived in equation[5], and the plurality of matrices $Avg^k(V(f)^H)$ as derived in equation[6]. If the calibration procedure is used, the MIMO channel response field **608** may comprise an indication of the number of rows in the matrices which are contained in the MIMO channel response field **608**, an indication of the number of columns in the matrices which are contained in the MIMO channel response field **608**, the matrix D_Δ as derived in equation[7], and the matrix $Avg^k(V_\Delta)$ as derived in equation[8].

The initial MIMO channel request frame **500** may be sent by the transmitting mobile terminal **202** to the receiving mobile terminal **222** without beamforming, and utilizing a number of spatial streams may equal the number of antenna. For each spatial stream, the lowest data rate may be used when transmitting the MIMO channel request frame **500** to enable the transfer of information between the transmitting mobile terminal **202** and receiving mobile terminal **222** to be as robust as possible. For example, with reference to FIG. **2**, without beamforming antenna **212** may transmit a signal which is proportional to signal s_1 **206** only, while antenna **214** may transmit a signal which is proportional to signal s_2 **208** only, and antenna **216** may transmit a signal which is proportional to signal s_3 **210** only such that:

$$X=cS, \text{ where} \qquad \text{equation[10]}$$

S may be represented by a 3×1 matrix $\{s_1, s_2, s_3\}$, X may be represented by a 3×1 matrix $\{x_1, x_2, x_3\}$, and c may be a scalar entity.

Any individual field in either the MIMO channel request frame **500** or the MIMO channel response frame **600** may comprise a plurality of octets of binary data. The MIMO channel request frame **500**, the MIMO channel response frame **600**, and any individual field in either the MIMO channel request frame **500** or the MIMO channel response frame **600** may be of variable length. The MIMO channel request frame **500** or the MIMO channel response frame **600** may comprise information which indicates the length of the respective frame. The MIMO channel request frame **500** or the MIMO channel response frame **600** may comprise information which indicates the length of any fields contained within the respective frame. The MIMO channel request frame **500** and the MIMO channel response frame **600** may comprise other information which enable a receiving mobile terminal **222** to communicate feedback information about the channel estimates that the receiving mobile terminal **222** has computed for the RF channel **242** to a transmitting mobile terminal **202**.

FIG. **7** is an exemplary flowchart illustrating steps in the exchange of RX/TX feedback information utilizing MIMO mode request and MIMO mode response frames in accordance with an embodiment of the invention. Referring to FIG. **7**, in step **702** a transmitting mobile terminal **202** may send a MIMO mode request frame to a receiving mobile terminal **222**. In step **704** the receiving mobile terminal **222** may receive the MIMO mode request frame from the transmitting mobile terminal **202**. In step **706** the receiving mobile terminal **222** may determine the transmitting mode. If the receiving mobile terminal **222** determines the transmitting mode, in step **710**, the receiving mobile terminal **222** may transmit a MIMO mode response frame to the transmitting mobile terminal **202** containing information about the desired transmitting mode. If the receiving mobile terminal **222** does not determine the transmitting mode, in step **708**, the receiving mobile terminal **222** may transmit a MIMO mode response frame to the transmitting mobile terminal **202** which contains no feedback information on the desired transmitting mode.

FIG. **8** is an exemplary flowchart illustrating steps in the exchange of RX/TX feedback information utilizing MIMO channel request and MIMO channel response frames in accordance with an embodiment of the invention. Referring to FIG. **8**, in step **802** a transmitting mobile terminal **202** may send a MIMO channel request frame to a receiving mobile terminal **222**. In step **804** the receiving mobile terminal **222** may receive the MIMO channel request frame from the transmitting mobile terminal **202**. In step **806** the receiving mobile terminal **222** may determine whether a null response is to be returned to the transmitting mobile terminal **202**. If a null response is to be returned, in step **808**, the receiving mobile terminal **222** may transmit a MIMO channel response frame to the transmitting mobile terminal **202** containing null channel information.

If a null response is not to be sent, in step **810** the receiving mobile terminal may determine whether to send a complete channel response. If a complete channel response is to be sent, in step **812** the receiving mobile terminal **222** may transmit a MIMO channel response frame to the transmitting mobile terminal **202** containing the number of transmit antenna, the number of receive antenna, and a complete channel estimate matrix computed during the processing of the preamble field in the preceding MIMO channel request frame.

If a complete channel response is not to be sent, in step **814**, the receiving mobile terminal **222** may compute a complete channel estimate matrix based on the preamble field in the preceding MIMO channel request frame. In step **816**, the receiving mobile terminal **222** may compute the matrix decomposition on the complete channel estimate matrix. In step **816**, matrix decomposition on the complete channel estimate matrix may be performed by a plurality of methods comprising SVD, QR decomposition, lower diagonal, diagonal, upper diagonal (LDU) decomposition, and Cholesky decomposition. In step **818**, the receiving mobile terminal **222** may transmit a MIMO channel response frame to the transmitting mobile terminal **202** containing the number of transmit antenna, the number of receive antenna, the right singular vector matrix, and the diagonal matrix of singular values.

The channel feedback method may enable more precise estimation of RF channel characteristics than is possible with conventional IEEE 802.11 systems, or when utilizing other proposals for new RX/TX feedback mechanisms. In conventional IEEE 802.11 specifications, there may be no feedback mechanism by which the receiving mobile terminal **222** may indicate a specific transmitting mode to be utilized by a transmitting mobile terminal **202**. Consequently, in conventional systems based upon IEEE 802.11, the transmitting mobile terminal **202** may independently select a transmitting mode with no mechanism by which the transmitting mode may be adapted to the requirements of the receiving mobile terminal **222**. The MIMO mode response mechanism may enable a receiving mobile terminal **222** to suggest a particular transmitting mode to the transmitting mobile terminal **202**.

The channel feedback method described may enable the receiving mobile terminal **222** to efficiently communicate feedback information, to the transmitting mobile terminal **202**, about the characteristics of the RF channel **242** as detected at the receiving mobile terminal **222**. In response, the transmitting mobile terminal **202** may adapt the RF signals that are transmitted to the receiving mobile terminal **222** based upon the channel feedback information received from the receiving mobile terminal **222**. Embodiments of the invention which have been described may minimize the quantity of feedback information and thereby reduce the amount of overhead imposed on the RF channel as a result of RX/TX feedback. This may enable the channel feedback mechanism to be utilized effectively in fast fading RF channels. As a result, the channel feedback method may enable the transmitting mobile terminal to achieve higher information transfer rates, and more effective beamforming on signals that are transmitted to the receiving mobile terminal via an RF channel.

The invention may not be limited to the SVD method to reduce the amount of feedback information which is sent via an RF channel. A plurality of methods may be utilized for reducing the quantity of feedback information when compared to the amount of information that is contained in a full channel estimate matrix. These methods may comprise, for example, SVD, LDU decomposition, Eigenvalue decomposition, QR decomposition, and Cholesky decomposition.

Accordingly, the present invention may be realized in hardware, software, or a combination of hardware and software. The present invention may be realized in a centralized fashion in at least one computer system, or in a distributed fashion where different elements are spread across several interconnected computer systems. Any kind of computer system or other apparatus adapted for carrying out the methods described herein is suited. A typical combination of hardware and software may be a general-purpose computer system with a computer program that, when being loaded and executed, controls the computer system such that it carries out the methods described herein.

The present invention may also be embedded in a computer program product, which comprises all the features enabling the implementation of the methods described herein, and which when loaded in a computer system is able to carry out these methods. Computer program in the present context means any expression, in any language, code or notation, of a set of instructions intended to cause a system having an information processing capability to perform a particular function either directly or after either or both of the following: a) conversion to another language, code or notation; b) reproduction in a different material form.

While the present invention has been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the present invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the present invention without departing from its scope. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed, but that the present invention will include all embodiments falling within the scope of the appended claims.

What is claimed is:

1. A method for communication, the method comprising:

computing a plurality of channel estimate matrices based on signals received by a mobile terminal from a base station, via one or more downlink RF channels, wherein said plurality of channel estimate matrices comprise coefficients derived from performing a singular value matrix decomposition (SVD) on said received signals; and

transmitting said coefficients as feedback information to said base station, via one or more uplink RF channels.

2. The method according to claim 1, comprising computing each of said plurality of channel estimate matrices for a corresponding one of a plurality of tones, wherein each of said plurality of tones corresponds to one or more distinct frequencies.

3. The method according to claim 2, comprising computing one or both of, a right singular vector matrix and a singular value matrix, corresponding to each of said plurality of channel estimate matrices.

4. The method according to claim 3, comprising computing an average singular value matrix based on an average of a plurality of said computed singular value matrices, wherein said average of said plurality of said computed singular value matrices is computed based on said plurality of tones.

5. The method according to claim 4, comprising communicating said computed average singular value matrix via said transmitted feedback information.

6. The method according to claim 5, wherein said computed average singular value matrix comprises a matrix rank, which is equal to the number of nonzero singular values in said computed average singular value matrix.

7. The method according to claim 6, wherein each of said nonzero singular values in said computed average singular value matrix comprises a determined number of bits.

8. The method according to claim 3, comprising computing said coefficients based on an average of a plurality of said computed right singular vector matrices, wherein each of said coefficients is computed based on a corresponding distinct at least a portion of said plurality of tones.

9. The method according to claim 8, wherein each value in said coefficients comprises a corresponding magnitude value and phase value.

10. The method according to claim 9, wherein each of said corresponding magnitude value comprises a determined number of bits, and each of said corresponding phase value comprises a separately determined number of bits.

11. A system for communication, the system comprising:

one or more circuits of a mobile terminal that are operable to compute a plurality of channel estimate matrices based on signals received by said mobile terminal from a base station, via one or more downlink RF channels, wherein said plurality of channel estimate matrices comprise coefficients derived from performing a singular value matrix decomposition (SVD) on said received signals; and

said one or more circuits are operable to transmit said coefficients as feedback information to said base station, via one or more uplink RF channels.

12. The system according to claim 11, wherein said one or more circuits are operable to compute each of said plurality of channel estimate matrices for a corresponding one of a plurality of tones, wherein each of said plurality of tones corresponds to one or more distinct frequencies.

13. The system according to claim 12, wherein said one or more circuits are operable to compute one or both of, a right singular vector matrix and a singular value matrix, corresponding to each of said plurality of channel estimate matrices.

14. The system according to claim 13, wherein said one or more circuits are operable to compute an average singular value matrix based on an average of a plurality of said computed singular value matrices, wherein said average of said plurality of said computed singular value matrices is computed based on said plurality of tones.

15. The system according to claim 14, wherein said one or more circuits are operable to communicate said computed average singular value matrix via said transmitted feedback information.

16. The system according to claim 15, wherein said computed average singular value matrix comprises a matrix rank, which is equal to the number of nonzero singular values in said computed average singular value matrix.

17. The system according to claim 16, wherein each of said nonzero singular values in said computed average singular value matrix comprises a determined number of bits.

18. The system according to claim 13, wherein said one or more circuits are operable to compute said coefficients based on an average of a plurality of said computed right singular vector matrices, wherein each of said coefficients is computed based on a corresponding distinct at least a portion of said plurality of tones.

19. The system according to claim 18, wherein each value in said coefficients comprises a corresponding magnitude value and phase value.

20. The system according to claim 19, wherein each of said corresponding magnitude value comprises a determined number of bits, and each of said corresponding phase value comprises a separately determined number of bits.

21. A method for communication, the method comprising:

computing a plurality of channel estimates based on signals received by a mobile terminal from a base station, via one or more downlink RF channels;

deriving a matrix based on the plurality of channel estimates, wherein the matrix comprises coefficients from performing a singular value matrix decomposition (SVD) on said plurality of channel estimates; and

transmitting the coefficients as feedback information to said base station, via one or more uplink RF channels.

22. A system for communication, the system comprising:

one or more circuits of a mobile terminal that are operable to compute a plurality of channel estimates based on signals received by said mobile terminal from a base station, via one or more downlink RF channels;

said one or more circuits are operable to derive a matrix based on said plurality of channel estimates, wherein said matrix comprises coefficients derived from performing a singular value matrix decomposition (SVD) on said plurality of channel estimates; and

said one or more circuits are operable to transmit said coefficients as feedback information to said base station, via one or more uplink RF channels.

* * * * *

EXHIBIT H

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U.S. PATENT: ***6,941,156***
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JOHN A BURSON
Certifying Officer

EXHIBIT HAPPX277

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(12) **United States Patent**
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(45) **Date of Patent: Sep. 6, 2005**

(54) **AUTOMATIC HANDOFF FOR WIRELESS PICONET MULTIMODE CELL PHONE**

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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 835 days.

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(52) **U.S. Cl.** **455/553.1**; 455/552.1
(58) **Field of Search** 455/403, 426.1, 455/552.1, 553.1

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,675,629 A * 10/1997 Raffel et al. 455/552.1
5,774,805 A * 6/1998 Zicker 455/426.1
5,794,141 A * 8/1998 Zicker 455/418
5,842,122 A * 11/1998 Schellinger et al. 455/403
6,167,278 A * 12/2000 Nilssen 455/462
6,167,285 A * 12/2000 Howe 455/552.1
6,317,582 B1 * 11/2001 Yoshinaga 455/11.1
6,363,246 B1 * 3/2002 Williams et al. 455/403
6,415,158 B1 * 7/2002 King et al. 455/552.1

* cited by examiner

Primary Examiner—Bing Q. Bui

(57) **ABSTRACT**

A technique and apparatus for transferring a communication link between two different modes of a multimode cell phone. For instance, an active telephone call using a cordless telephone RF communication link may be automatically switched (with user prompt if desired) to a cell phone call when desired (e.g., when the cordless telephone goes out of range of its base unit), and vice versa. CallerID Type 2 and Call Waiting may be used to switch the far end telephone from one line to the other with minimal (or even unnoticeable) disruption to the participants or content of the telephone connection.

19 Claims, 6 Drawing Sheets

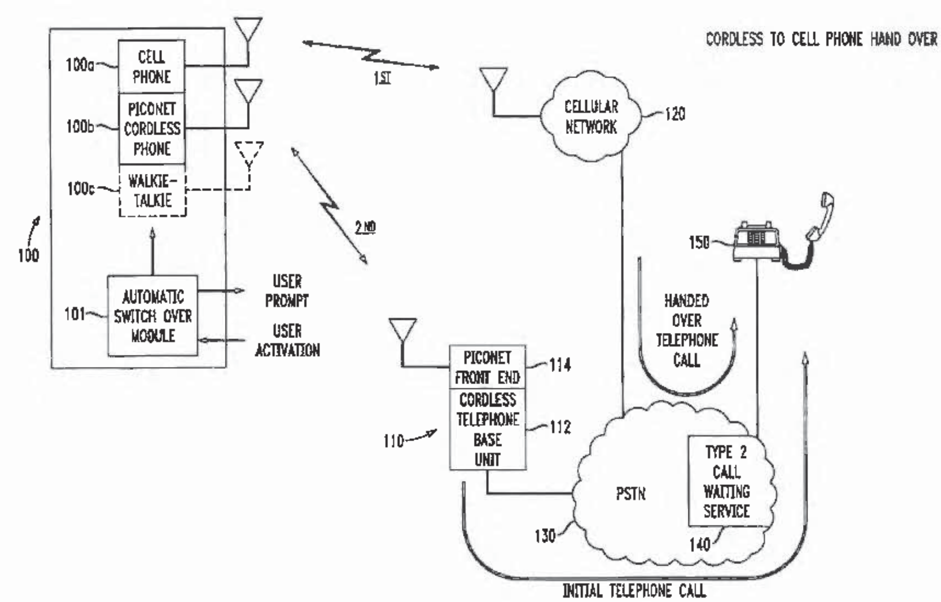


FIG. 1

CORDLESS TO CELL PHONE HAND OVER

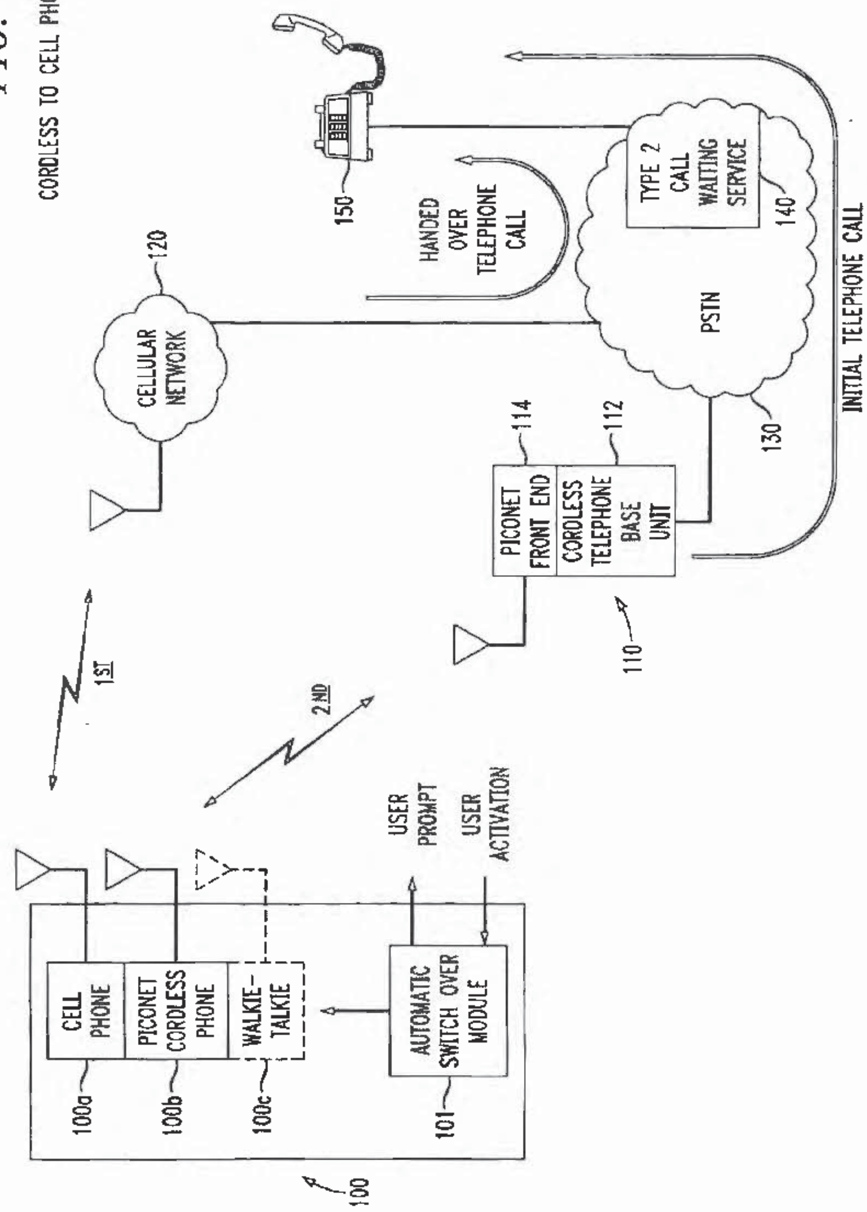


FIG. 2

CORDLESS TO CELL PHONE HAND OVER

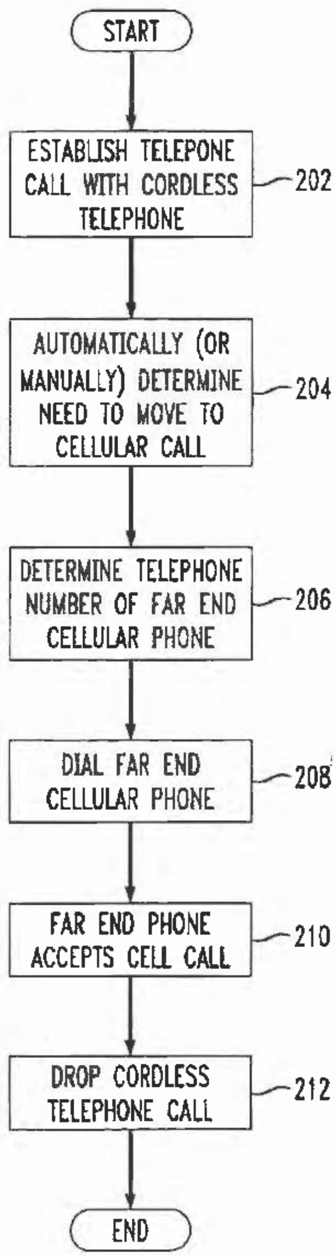


FIG. 3

WALKIE-TALKIE TO CELL PHONE HAND OVER

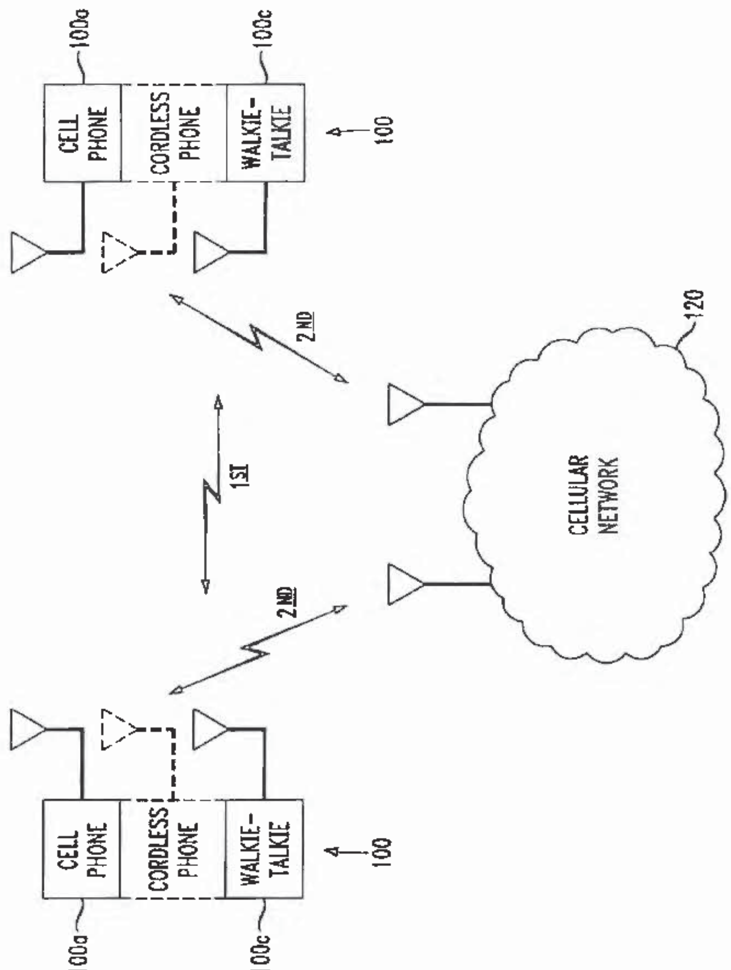


FIG. 4

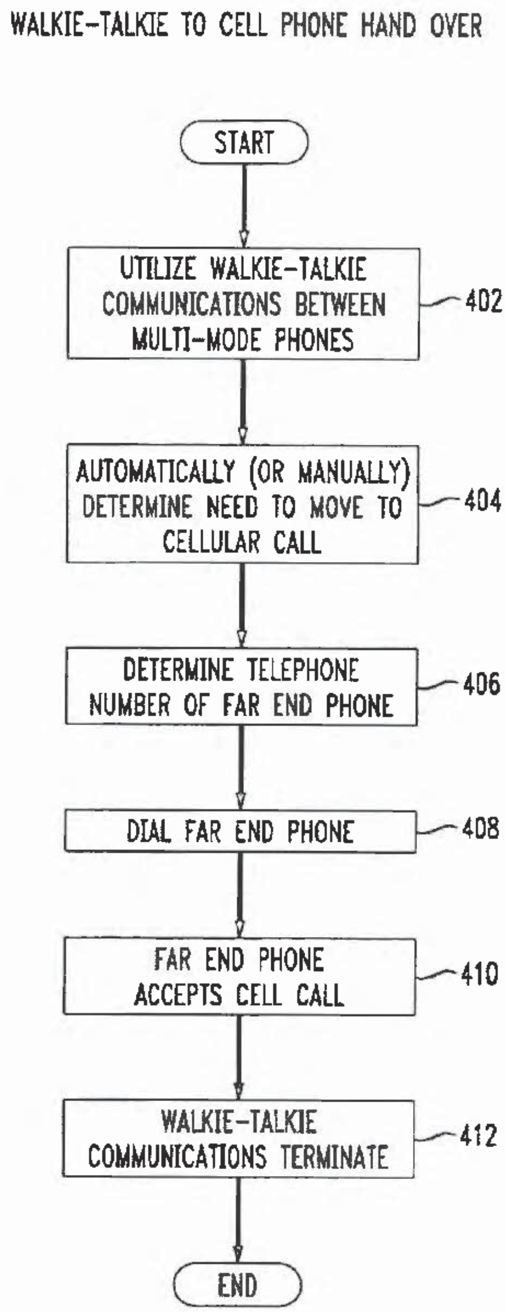

WALKIE-TALKIE TO CELL PHONE HAND OVER
START
UTILIZE WALKIE-TALKIE COMMUNICATIONS BETWEEN MULTI-MODE PHONES
402
AUTOMATICALLY (OR MANUALLY) DETERMINE NEED TO MOVE TO CELLULAR CALL
404
DETERMINE TELEPHONE NUMBER OF FAR END PHONE
406
DIAL FAR END PHONE
408
FAR END PHONE ACCEPTS CELL CALL
410
WALKIE-TALKIE COMMUNICATIONS TERMINATE
412
END

FIG. 5

WALKIE-TALKIE TO CORDLESS HAND OVER

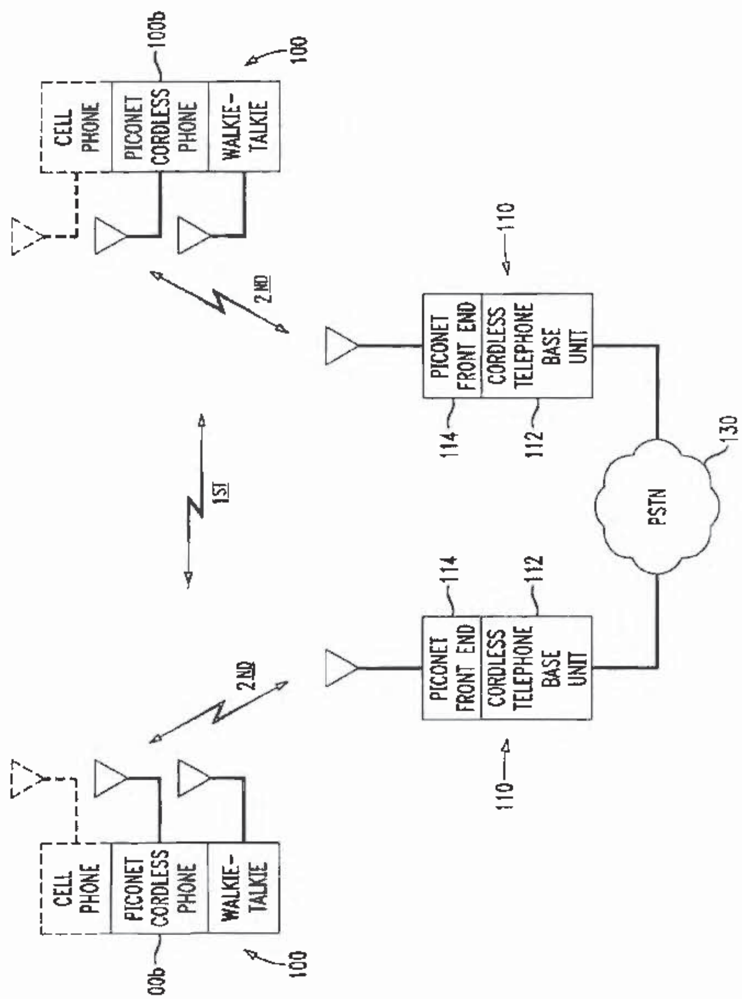
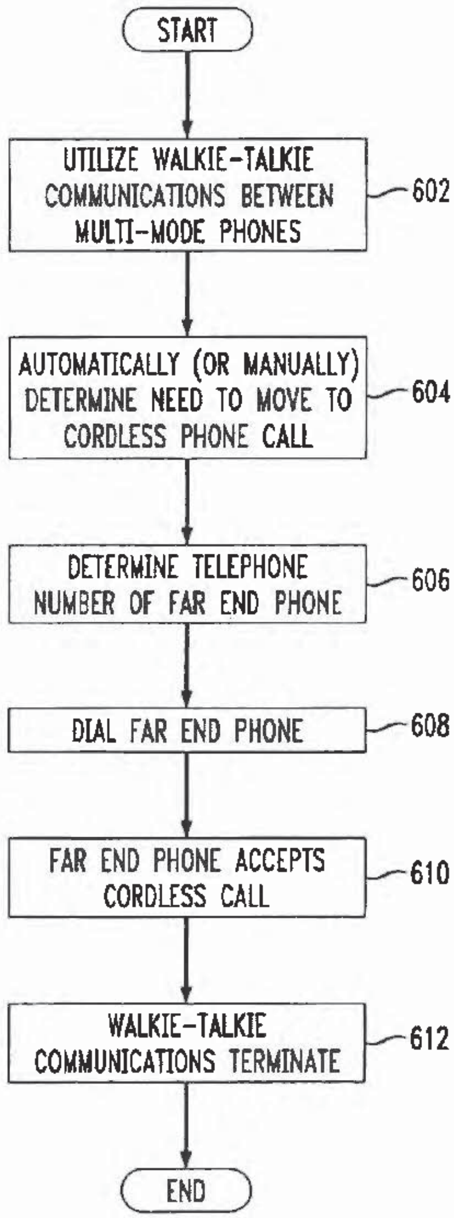


FIG. 6

WALKIE-TALKIE TO CORDLESS HAND OVER



AUTOMATIC HANDOFF FOR WIRELESS PICONET MULTIMODE CELL PHONE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to piconet wireless networks. More particularly, it relates to the use of a combination 3-in-1 cell phone/cordless telephone/walkie-talkie device.

2. Background of Related Art

One of the new and useful ideas coming out of BLUETOOTH technology is the 3-in-1 cell phone, where a cell phone has advanced and additional capabilities to operate as a cordless telephone when near a matching cordless telephone base station, or to work as a walkie-talkie when near another similarly capable handset. This provides a cell phone that has advantages over competitors' cell phones which are not similarly capable, including the ability and convenience of storing all phone book data, calling history and user preferences.

Using such systems, a cell phone user has the ability and convenience of accessing a cordless telephone base station when, e.g., arriving home. Having such access, a cordless telephone user might make telephone calls using their cell phone handset accessing their cordless telephone base unit at times when they might not otherwise use their cell phone handset, e.g., when at home in the vicinity of a cordless telephone.

Convenience aside, a 3-in-1 cell phone conventionally provides establishment of a telephone call with a wireless cell phone network, or with a local cordless telephone, depending upon which mode the phone is in. To operate the 3-in-1 cell phone in a cordless telephone mode, the 3-in-1 cell phone is manually switched to a cordless telephone mode by the user, and then a telephone call is made from the base unit. Similarly, to operate a 3-in-1 cell phone in a cellular mode, the 3-in-1 phone is manually switched to a cellular mode, and then a cellular telephone call is established from the handset. To switch between cordless and cellular modes, the user must first terminate any existing telephone call, and then manually switch the mode of the 3-1 telephone.

There is a need in a 3-in-1 cell phone which provides smooth switchover and interaction between separate modes of operation.

SUMMARY OF THE INVENTION

In accordance with the principles of the present invention, a multimode cell phone comprises a cell phone functionality, and an RF communication functionality separate from the cell phone functionality. An automatic switch over module is in communication with both the cell phone functionality and the RF communication functionality. The automatic switch over module operates to switch a communication path established on either the cell phone functionality or the RF communication functionality, with another communication path established on the other of the cell phone functionality and the RF communication functionality.

A method of automatically switching between a first type RF communication link and a second type RF communication link different from the first type RF communication link, comprising participating in the first type RF communication link. An availability of the second type RF communication link is sensed, and if available, the second type RF communication link is established while the first type RF communication link remains active. The parties participating in the first type RF communication link are switched to active utilization of the second type RF communication link.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the drawings, in which:

FIG. 1 shows a multimode cell phone handing over a telephone call from a cordless mode to a cellular mode, in accordance with the principles of the present invention.

FIG. 2 shows an exemplary process for handing over a telephone call from the cordless mode of a multimode cell phone to a cellular mode of the multimode cell phone, in accordance with the principles of the present invention.

FIG. 3 shows a multimode cell phone handing over a walkie-talkie conversation to a cellular telephone call, in accordance with the principles of the present invention.

FIG. 4 shows an exemplary process for handing over a walkie-talkie conversation to a cellular telephone call handled by a cellular mode of a multimode cell phone, in accordance with the principles of the present invention.

FIG. 5 shows a multimode cell phone handing over a walkie-talkie conversation to a cordless telephone call, in accordance with the principles of the present invention.

FIG. 6 shows an exemplary process for handing over a walkie-talkie conversation to a cordless telephone call handled by a cordless telephone mode of a multimode cell phone, in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

More and more home and office devices are designed to form piconets, or small wireless networks. One popular piconet standard is commonly referred to as a BLUETOOTH™ piconet. Piconet technology in general, and BLUETOOTH™ technology in particular, provides peer-to-peer communications over short distances.

The wireless frequency of piconets may be 2.4 GHz as per BLUETOOTH™ standards, and/or typically have a 20 to 100 foot range. The piconet RF transmitter may operate in common frequencies that do not necessarily require a license from the regulating government authorities, e.g., the Federal Communications Commission (FCC) in the United States. Alternatively, the wireless communication can be accomplished with infrared (IR) transmitters and receivers, but this is less preferable because of the directional and visual problems often associated with IR systems.

A plurality of piconet networks may be interconnected through a scatternet connection, in accordance with BLUETOOTH™ protocols. BLUETOOTH™ network technology may be utilized to implement a wireless piconet network connection (including scatternet). The BLUETOOTH™ standard for wireless piconet networks is well known, described in the BLUETOOTH™ specification, version 1.1, publicly available from the web site www.bluetooth.com. The entire BLUETOOTH™ specification (core and profiles), version 1.1, in particular the Cordless Telephony Profile portion of version 1.1 of the Profiles, is explicitly incorporated herein by reference,.

The BLUETOOTH™ specification defines a Cordless Telephony Profile. In particular, Part K:3 of the BLUETOOTH™ specification version 1.1, Profiles, pages 99–144, defines the features and procedures that are required for interoperability between different cordless telephones, e.g., between remote handsets and corresponding base units.

The '3-in-1' phone is a solution for providing an extra mode of operation to cellular phones, using BLUETOOTH™ as a short-range bearer for accessing fixed network telephony services via a base station. The 3 functions include making telephone calls via a base station (i.e., cordless telephone mode), making direct intercom calls between two terminals (e.g., between two cellular telephone handsets), and, of course, making an otherwise conventional cellular phone call.

The Cordless Telephony Profile defines two roles: Gateway (GW) and Terminal (TL). The Gateway acts as a terminal endpoint from the external network point of view and handles all Interworking towards that network. The Gateway is the central point with respect to external calls, which means that it handles all call set-up requests to/from the external network. The Terminal is the wireless user terminal (e.g., the remote handset of a cordless telephone). The Cordless Telephony profile supports a small number (i.e., less than 7) of terminals, or 3 active voice terminals. In accordance with the principles of the present invention, the multimode 3-in-1 cell phone includes the Cordless Telephony Profile of BLUETOOTH™ capability.

The present invention provides a technique for transferring an active telephone call from cordless telephone mode to cell phone mode (and vice versa) in a 3-in-1 cell phone. In particular, in accordance with the principles of the present invention, CallerID Type2 and Call Waiting are used to switch the far end telephone from one line to the other with minimal (or even unnoticeable) disruption to the participants or content of the telephone connection.

Using conventional 3-in-1 phones, there is no provision for automatically transferring a call from a cordless handset mode to a cell phone mode (e.g., when a user is leaving a household where a matching cordless telephone base unit). Similarly, there is conventionally no automatic way to transfer a telephone call from a cell phone to a cordless telephone base unit when the user returns home. Certainly, a user could manually hang up the 3-in-1 cell phone in one mode (e.g., cordless telephone mode) and initiate a new telephone call using a new mode (e.g., cell phone mode). However, this would require manual operations performed by the user, being a bit of a nuisance to the user prone to error, and also a significant and potentially lengthy disruption to the underlying telephone call.

FIG. 1 shows a multimode cell phone handing over a telephone call from a cordless mode to a cellular mode, in accordance with the principles of the present invention.

In particular, as shown in FIG. 1, a multimode cell phone **100** includes multiple functional modes, e.g., a cell phone mode **100***a*, a piconet cordless telephone **100***b*, and a walkie-talkie mode **100***c*.

Importantly, an automatic switch over module **101** is in communication with each communication path functionality, e.g., with the cell phone functionality **100***a*, the piconet cordless telephone functionality **100***b*, and the walkie-talkie functionality **100***c*. The desired mode of the multimode cell phone **100** may be controlled through suitable communications with each communication path functionality **100***a*–**100***c*.

Preferably, more than one mode of the multimode cell phone **100** may operate simultaneously, allowing the establishment of a secondary communication path in the background, allowing easy and quick switch over as desired or required. For instance, while operating in a cell phone mode, the automatic switch over module **101** of the multimode cell phone **100** may detect walkie-talkie communication activity from the far party's multimode cell phone **100**, and establish a communication link therebetween even while the two parties remain in a cell phone conversation.

In the cordless telephone mode, the multimode cell phone **100** communicates between handset unit **100** and a matching piconet cordless telephone base unit **110** using a suitable piconet front end **114** in the base unit **110** and a matching piconet front end within the multimode cell phone **100**.

For explanation purposes, FIG. 1 depicts an established telephone call between the multimode cell phone **100** and a far end telephone **150** (which in the example is a landline telephone accessed through a cellular network). Of course, the far end telephone can be any telephonic device, multimode or single mode.

Once the multimode cell phone **100** extends beyond its acceptable range, the telephone call would ordinarily be dropped, perhaps involuntarily. However, in accordance with the principles of the present invention, the telephone call between the multimode cell phone **100** and the far end telephone **150** is automatically re-established using the cellular network **120**. By automatically changing the mode of the multimode cell phone **100** (preferably subsequent to a prompt to the user for permission to transfer), the conversation or other communication between the parties is transferred to the newly established cell phone call.

While FIGS. **1** and **2** depict the transfer of a telephone call from a cordless telephone call to a cellular telephone call, the converse is preferably also possible. For example, a person using a cell phone having 3-in-1 capability in accordance with the principles of the present invention is on their way home while talking on their 3-in-1 cell phone in cellular (or other wireless network) mode. Assume that that person then arrives at their home and becomes within range of the cordless telephone base station that is matched to the cordless telephone mode of the 3-in-1 cell phone.

In accordance with the principles of the present invention, an automated procedure may be initiated by the user of the multimode cell phone **100** at the press of a designated button. The user may be prompted about impending loss of signal or otherwise loss of the established telephone call, and may be prompted to permit establishment of and ultimately transfer to an alternative type communication path (e.g., a cellular phone call). In response, the user preferably activates a suitable button, e.g., a dedicated button called, e.g., "Switch to Cell Network", or simply "Switch Communication Path". Of course, the transfer may be entirely automated without requiring input from the user, within the scope of the invention.

FIG. **2** shows an exemplary process for handing over a telephone call from the cordless mode of a multimode cell phone to a cellular mode of the multimode cell phone, in accordance with the principles of the present invention.

In particular, as shown in step **202** of FIG. **2**, a cordless telephone call is established using a cordless telephone mode of the multimode cell phone **100**.

In step **204**, the need (or desire) to change communication modes to a cellular mode is determined.

In step **206**, the telephone number of the far end telephone **150** (or another suitable phone accessible to the far end party) is determined, e.g., using a call related information service such as a CallerID type service provided by the PSTN **130** (FIG. **1**).

In step **208**, the determined telephone number of the far end telephone **150** is dialed, and passes through to the far end telephone **150** using, e.g., a Call Waiting type service **140**.

In step 210, the user of the far end telephone 150 accepts the newly incoming telephone call in response to their Call Waiting and/or Type 2 CallerID service.

In step 212, the old communication path (in this case the cordless telephone call) is dropped, perhaps after a desirable delay (e.g., after 5 seconds).

The converse of the example of FIGS. 1 and 2 is also possible. For instance, the multimode cell phone 150 may move from a cell phone call to a cordless telephone call, e.g., once the multimode cell phone 100 becomes within range of its matching base unit 110. In this case, the multimode cell phone 100 automatically establishes a wireless connection with the cordless telephone base station 110 using, e.g., a wireless piconet protocol conforming to the BLUETOOTH™ standard. Using the wireless cordless telephone communication path established between the multimode cell phone 150 and its base unit 110, a suitable telephone number relating to the far end party may be determined and passed to the cordless telephone functionality of the multimode cell phone 100.

Preferably, the initial caller in the first telephone call controls the re-establishment of an alternative mode communication path. For instance, in the disclosed embodiment, the far end party's telephone number is obtained by the multimode cell phone 150 that initiated the first telephone call (i.e., who called whom).

Telephone numbers for the far end party may be recalled from a last number dialed functionality of the multimode cell phone 150. However, call related information such as CallerID information may be used to allow a far end party to themselves initiate a communication path mode transfer.

In the event that both parties attempt to initiate a communication mode change (e.g., from cordless to cellular), conventional collision detect and variously delayed retry schemes may be utilized.

The far end party's telephone number may be obtained for transfer between cordless and cellular telephone modes, e.g., from last number dialed memory (if the user initiated the call), or from the last number received in Caller ID memory (if the current call was incoming from the far end party).

In the given example, the cordless telephone base station 110 then goes off hook and dials the telephone number of the far end party, whether or not the far end party initiated the transferred telephone call. In this example, from the far-end user's perspective, the far end user hears that there is a call coming in (e.g., using a Call Waiting service) and may or may not review CallerID information such as the telephone number and/or name of the calling party, before they accept the new call. Using Call Waiting type service, the far end party would accept the new communication mode by simply activating a FLASH button and abandoning the first telephone call (which will eventually be dropped either by the base unit 110 of the calling party such as is shown in step 212 of FIG. 1, or by the telephone company if the telephone company senses a lack of activity on the abandoned telephone call. To this end, the cordless telephone base unit 110 may notify the handset that the new communication path has been established and accepted, allowing the base unit 110 to finally switch the audio path from the cell phone link to the BLUETOOTH™ cordless telephone link and then disconnect the cell phone call.

In a more automated embodiment of a 3-in-1 phone having automatic handoff capability between modes in accordance with the principles of the present invention, the far end phone 150 includes a capability to sense when a switch between communication path modes is occuring on the near end, and if so to automatically activate a flash signal on the telephone line.

The automatic handoff capability may be implemented using a lookup table including entries relating to alternate telephone numbers, e.g., associated cell phone numbers, land line numbers, etc. However, care should be taken to avoid the vulnerability to erroneous communication path switching.

A safer, alternative approach implements a predetermined signaling tone (e.g. a DTMF tone sent from the near end (switching) phone and a detector on the far end phone 150 recognizing it and preparing to flash when the new call comes in. Of course, there could be a combination of both. Let's look at this example.

A person on their way home is talking to a co-worker on their multimode cell phone 100 (in cell phone mode). That person then arrives home and sits down near their cordless base station 110. Preferably, the multimode cell phone 100 maintains a configuration such that when a cordless telephone link (e.g., a piconet BLUETOOTH™ link of good quality) has been established with the cordless base for a given length of time (e.g., for at least two minutes), then the multimode cell phone handset 100 will allow switch over to the cordless telephone call and ultimately drop or terminate the original cell phone call.

To accomplish this, the multimode cell phone 100 may send, e.g., a quick DTMF "7" followed by a DTMF "9" (i.e., representing the characters "SW") notifying the near end user and the far end phone 150 (and user) that a switch is about to happen. The far end phone 150 would remain ready for a switch over for a given length of time, e.g., for 20 seconds. The multimode cell phone 100 makes the alternate phone call as described above. After the far end phone receives the new call, it checks the call related information (e.g., CallerID data) against entries in a suitable lookup table, and if it finds a match, then automatically flashes the telephone line on the original telephone call. The near end phone, as in the first example, is then notified that the second call has gone through, allowing the conversation to continue on a switched over communication path.

In the unlikely event that the switchover does not succeed, the switchover is preferably delayed (e.g., for 10 seconds or more) to allow the users to switch back to the initial telephone call or communication path.

Similar to the above examples, the multimode cell phone 100 may switch from cordless mode to cell phone mode when the user wishes to leave the proximity of the cordless telephone base unit 110. For instance, manual activation of a suitable button, or automatic detection of the quality of the RF link (e.g., the BLUETOOTH™ piconet link) below a preset level may initiate this feature.

The present invention is equally applicable to a 2-in-1 phone as it is to a 3-in-1 or more mode phone. For instance, automatic switching from a walkie-talkie mode can be performed without the need to control a telephone network.

For instance, FIG. 3 shows a multimode cell phone 100 handing over a walkie-talkie conversation to a cellular telephone call, in accordance with the principles of the present invention.

In particular, as shown in FIG. 3, a multimode cell phone 100 is initially operating in a walkie-talkie mode over a 1^{st} communication path to another multimode cell phone 100. Thereafter, at a desired point (e.g., when the walkie-talkies reach the limit of their range) switchover to the cellular network 120 is initiated, either manually by the user, or automatically but preferably with a prompt to the user before completion.

FIG. 4 shows an exemplary process for handing over the walkie-talkie conversation to the cellular telephone call handled by the cellular mode of the multimode cell phones 100 (or by a separate cell phone at the far end), in accordance with the principles of the present invention.

In particular, as shown in step 402 of FIG. 4, the walkie-talkie modes 100c of the multimode cell phones 100 are utilized.

In step 404, the need to initiate, establish and switch over to another mode (e.g., to a cellular phone call) is determined, either automatically or manually, by an appropriate processor in the multimode cell phone 100.

In step 406, the telephone number of the far end phone is determined.

In step 408, the far end phone is dialed.

In step 410, the far end phone receives and accepts the cell phone call using its cell phone functionality 100*a*. Call related information such as CallerID may be used by the far end party to assist in their acceptance of the incoming call while conversing using the walkie-talkie modes 100*c*.

In step 412, after the cell phone call has been established and accepted by the far end party, switchover to the cell phone call can be accomplished, and walkie-talkie communications between the two multimode cell phones 100 can be terminated.

FIG. 5 shows a multimode cell phone 100 handing over a walkie-talkie conversation to a piconet cordless telephone call, in accordance with the principles of the present invention.

In particular, as shown in FIG. 5, a multimode cell phone 100 is initially operating in a walkie-talkie mode over a 1^{st} communication path to another multimode cell phone 100. Thereafter, at a desired point (e.g., when the walkie-talkies reach the limit of their range) switchover to the cellular network 120 is initiated, either manually by the user, or automatically but preferably with a prompt to the user before completion.

The particular frequency band of operation of the walkie-talkie functionality 100*c* may be any suitable range, digital or analog. One preferred frequency band and protocol is the Family Radio System (FRS) band, having an operable range of over 1 mile.

FIG. 6 shows an exemplary process for handing over the walkie-talkie conversation to the cellular telephone call handled by the cellular mode of the multimode cell phones 100 (or by a separate cell phone at the far end), in accordance with the principles of the present invention.

In particular, as shown in step 602 of FIG. 6, the walkie-talkie modes 100*c* of the multimode cell phones 100 are utilized.

In step 604, the need to initiate, establish and switch over to another mode (e.g., to a cordless telephone call using a piconet cordless telephone) is determined, either automatically or manually, by an appropriate processor in the multimode cell phone 100.

In step 606, the telephone number of the far end phone is determined.

In step 608, the far end cordless telephone is dialed.

In step 610, the far end phone receives and accepts the cordless telephone call using its piconet cordless phone functionality 100*b*. Call related information such as CallerID may be used by the far end party to assist in their acceptance of the incoming call while conversing using the walkie-talkie modes 100*c*.

In step 612, after the cordless telephone call has been established and accepted by the far end party, switchover to the cordless telephone call can be accomplished, and walkie-talkie communications between the two multimode cell phones 100 can be terminated.

The present invention has application in any piconet device, including cell phones, laptop computers, cordless telephones, etc.

While the invention has been described with reference to the exemplary preferred embodiments thereof, those skilled in the art will be able to make various modifications to the described embodiments of the invention without departing from the true spirit and scope of the invention.

What is claimed is:

1. A multimode cell phone, comprising:

a cell phone functionality; and

an RF communication functionality separate from said cell phone functionality;

a module to establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality; and

an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality.

2. The multimode cell phone according to claim 1, wherein:

said RF communication functionality is a cordless telephone.

3. The multiphone cell phone according to claim 2, wherein:

said cordless telephone utilizes a piconet to communicate between a base unit and a matching remote handset.

4. A method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link, comprising:

participating in said first type RF communication link;

sensing an availability of said second type RF communication link;

establishing from said multimode cell phone said second type RF communication link while said first type RF communication link remains active at said multimode cell phone; and

switching parties participating in said first type RF communication link to active utilization of said second type RF communication link.

5. The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, further comprising, after said switching parties step:

terminating said first type RF communication link.

6. The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, further comprising:

prompting a user of said availability of said second type RF communication link.

7. The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, wherein:

at least one of said RF communication links is a telephone call.

8. The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, wherein:

said first type RF communication link is a cell phone call.

9. The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 8, wherein:

said second type RF communication link is a cordless telephone call.

10. The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at a multimode cell phone different from said first type RF communication link according to claim 9, wherein:

a cordless telephone used to participate in said cordless telephone call utilizes a piconet to communicate between a cordless telephone base unit and a matching remote handset.

11. The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at a multimode cell phone different from said first type RF communication link according to claim 4, wherein:

said second type RF communication link is a walkie-talkie link.

12. Apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at a multimode cell phone different from said first type RF communication link, comprising:

means for participating in said first type RF communication link;

means for sensing an availability of said second type RF communication link;

means for establishing said second type RF communication link, when said second type RF communication link is sensed to be available by said means for sensing; and

means for switching parties participating in said first type RF communication link to active utilization of said second type RF communication link.

13. The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, further comprising:

means for terminating said first type RF communication link after said means for switching switches said parties.

14. The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, further comprising:

means for prompting a user of said availability of said second type RF communication link.

15. The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 14, wherein:

said second type RF communication link is a walkie-talkie link.

16. The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, wherein:

at least one of said RF communication links is a telephone call.

17. The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, wherein:

said first type RF communication link is a cell phone call.

18. The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 17, wherein:

said second type RF communication link is a cordless telephone call.

19. The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 18, wherein:

a cordless telephone used to participate in said cordless telephone call is adapted to implement a piconet protocol to communicate between a cordless telephone base unit and a matching remote handset.

* * * * *

EXHIBIT I

7689668

THE UNITED STATES OF AMERICA

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UNITED STATES DEPARTMENT OF COMMERCE

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August 13, 2018

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF THE FILE WRAPPER AND CONTENTS OF:

APPLICATION NUMBER: ***09/888,493***
FILING DATE: ***June 26, 2001***
PATENT NUMBER: ***6941156***
ISSUE DATE: ***September 06, 2005***

UNITED STATES PATENT AND TRADEMARK OFFICE
DEPARTMENT OF COMMERCE

Certified by

Andrei Iancu

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

SRJ

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER (Large Entity)

Application Number: **09/888,493** Group Art Unit: **2642**

Filed: **June 26, 2001** Examiner Name: **BUI, Bing Q.**

Applicant: **MOONEY** Attorney Docket Number: **20-183**

TITLE: **AUTOMATIC HANDOFF FOR WIRELESS PICONET MULTIMODE CELL PHONE**

Total Number of Pages in this Submission: 10

COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

SIR:

Transmitted herewith is:
An amendment in the above-identified application (9 Pages)

The fee has been calculated and is transmitted as shown below.

CLAIMS AS AMENDED					
	CLAIMS REMAINING AFTER Amendment	HIGHEST # PREV. PAID FOR	# OF EXTRA CLAIMS	RATE	ADDITIONAL FEE
Total Claims	19	19	0	x $50 =	$0.00
Independent Claims	3	3	0	x $200 =	$ 0.00
Multiple Dependent Claim(s), if applicable				x $360=	
		TOTAL ADDITIONAL FEE:			$0.00

The Commissioner is hereby authorized to charge any additional fees required under 37 C.F.R. 1.16 or any patent application processing fees under 37 C.F.R. 1.17 associated with this communication, or credit any over payment to **Deposit Account No. 50-0687 under Order No. 20-183.**

Respectfully submitted,

William H. Bollman
Reg. No.: 36,457
Attorney for Applicant(s)

Date: January 6, 2005

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.: **09/888,493**
Filed: **June 26, 2001**
Group Art Unit: **2642**
Examiner: **BUI, Bing Q.**
Atty Dkt No.: **MOONEY 71**
Our Ref.: **20-183**

IN RE PATENT APPLICATION OF:

MOONEY

TITLE: **AUTOMATIC HANDOFF FOR WIRELESS PICONET MULTIMODE CELL PHONE**

January 6, 2005

AMENDMENT

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

Sir:

Responsive to the Office Action dated December 8, 2004, please enter the following amendments and remarks in the subject application:

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A multimode cell phone, comprising:

a cell phone functionality; and

an RF communication functionality separate ~~, at least in part,~~ from said cell phone functionality;

a module to establish simultaneous communication paths from said multimode cell phone using both said cell phone functionality and said RF communication functionality; and

an automatic switch over module, in communication with both said cell phone functionality and said RF communication functionality, operable to switch a communication path established on one of said cell phone functionality and said RF communication functionality, with another communication path later established on the other of said cell phone functionality and said RF communication functionality.

2. (original) The multimode cell phone according to claim 1, wherein:

said RF communication functionality is a cordless telephone.

3. (original) The multiphone cell phone according to claim 2, wherein:

said cordless telephone utilizes a piconet to communicate between a base unit and a matching remote handset.

4. (currently amended) A method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link, comprising:

participating in said first type RF communication link;

sensing an availability of said second type RF communication link;

establishing from said multimode cell phone said second type RF communication link while said first type RF communication link remains active at said multimode cell phone; and

switching parties participating in said first type RF communication link to active utilization of said second type RF communication link.

5. (currently amended) The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, further comprising, after said switching parties step:

terminating said first type RF communication link.

6. (currently amended) The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, further comprising:

prompting a user of said availability of said second type RF communication link.

7. (currently amended) The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, wherein:

at least one of said RF communication links is a telephone call.

8. (currently amended) The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 4, wherein:

said first type RF communication link is a cell phone call.

9. (currently amended) The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 8, wherein:

said second type RF communication link is a cordless telephone call.

10. (currently amended) The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at a multimode cell phone different from said first type RF communication link according to claim 9, wherein:

a cordless telephone used to participate in said cordless telephone call utilizes a piconet to communicate between a cordless telephone base unit and a matching remote handset.

11. (currently amended) The method of automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at a multimode cell phone different from said first type RF communication link according to claim 4, wherein:

said second type RF communication link is a walkie-talkie link.

12. (currently amended) Apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at a multimode cell phone different from said first type RF communication link, comprising:

means for participating in said first type RF communication link;

means for sensing an availability of said second type RF communication link;

means for establishing said second type RF communication link, when said second type RF communication link is sensed to be available by said means for sensing; and

means for switching parties participating in said first type RF communication link to active utilization of said second type RF communication link.

13. (currently amended) The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, further comprising:

means for terminating said first type RF communication link after said means for switching switches said parties.

14. (currently amended) The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, further comprising:

means for prompting a user of said availability of said second type RF communication link.

15. (currently amended) The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, wherein:

at least one of said RF communication links is a telephone call.

16. (currently amended) The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 12, wherein:

said first type RF communication link is a cell phone call.

17. (currently amended) The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 16, wherein:

said second type RF communication link is a cordless telephone call.

18. (currently amended) The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 17, wherein:

a cordless telephone used to participate in said cordless telephone call is adapted to implement a piconet protocol to communicate between a cordless telephone base unit and a matching remote handset.

19. (currently amended) The apparatus for automatically switching between a first type RF communication link at a multimode cell phone and a second type RF communication link at said multimode cell phone different from said first type RF communication link according to claim 14, wherein:

said second type RF communication link is a walkie-talkie link.

REMARKS

Claims 1-19 remain pending in the application.

Claims 1-19 over Schellinger

Claims 1-19 were rejected under 35 USC 102(e) as allegedly being obvious over U.S. Pat. No. 5,842,122 to Schellinger et al. ("Schellinger"). The Applicant respectfully traverses the rejection.

In the rejection, the Examiner's cited art of Schellinger is closely related to the present application, but nevertheless the claims of the present application are clearly distinguishable.

In particular, the present application discusses the need for a smooth transition in a 3-in-1 cell phone (cell, cordless, walkie-talkie) between modes of operation. Thus, it is desired that there be minimal interruption in an ongoing conversation when switching between cell phone and cordless, etc. The present invention talks about the desirability for separate RF capabilities, for simultaneous establishment of links, to promote the smooth transition between links.

Claims 1-3 recite a module to establish **simultaneous communication paths from a multimode cell phone** using both a cell phone functionality and RF communication functionality. Claims 4-19 recite establishing **from a multimode cell phone** a second type RF communication link while a first type RF communication link **remains active** at the multimode cell phone.

The cited art of Schellinger instructs a central office (or cellular telephone system) to set up a three way call, and the cell phone answers and stays with the third party call when received.

In particular, Schellinger discloses a dual mode cellular cordless portable radiotelephone that is capable of ONE mode of communication, or the OTHER, BUT NOT BOTH SIMULTANEOUSLY.

In particular, Schellinger discloses automatic routing of an incoming call without inconveniencing the user. (Schellinger, col. 5, lines 10-13). A portable cellular cordless (PCC) device decides whether to remain in a cellular telephone system, or to change to a cordless telephone system. (Schellinger, col. 5, lines 29-39).

However, according to Schellinger, **automatic forwarding** systems **of a central office** are implemented to allow handoff of a call. See, e.g., col. 6, lines 12-15; and col. 6, line 24 (remote call forwarding performed). As explained by Schellinger at col. 7, lines 50-62, a call in process is handed off by producing a THREE WAY CALL through the **cellular telephone system** (i.e., NOT through the cell phone itself). To finally implement the handoff, the cell phone switches to a landline leg of a **three way call** (set up by a central office and/or cellular telephone system), and the initial call is dropped.

The present invention requires a module to establish **simultaneous communication paths from a multimode cell phone** using both a cell phone functionality and RF communication functionality, or to establish **from a multimode cell phone** a second type RF communication link while a first type RF communication link **remains active** at the multimode cell phone. Schellinger fails to disclose simultaneous communication paths from a multimode cell phone as claimed by the claims of the present application.

For at least all the above reasons, claims 1-19 are patentable over the prior art of record. It is therefore respectfully requested that the rejection be withdrawn.

Conclusion

All objections and rejections having been addressed, it is respectfully submitted that the subject application is in condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

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EXHIBIT J

U 7694435

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

September 25, 2018

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THIS OFFICE OF:

U.S. PATENT: *7,039,435*
ISSUE DATE: *May 02, 2006*

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

P. SWAIN
Certifying Officer

US007039435B2

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

(10) **Patent No.:** **US 7,039,435 B2**
(45) **Date of Patent:** **May 2, 2006**

(54) **PROXIMITY REGULATION SYSTEM FOR USE WITH A PORTABLE CELL PHONE AND A METHOD OF OPERATION THEREOF**

(75) Inventors: **Richard L. McDowell**, Chalfont, PA (US); **Philip D. Mooney**, Sellersville, PA (US)

(73) Assignee: **Agere Systems Inc.**, Allentown, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 565 days.

(21) Appl. No.: **09/967,140**

(22) Filed: **Sep. 28, 2001**

(65) **Prior Publication Data**

US 2003/0064732 A1 Apr. 3, 2003

(51) **Int. Cl.**
H04B 7/00 (2006.01)

(52) **U.S. Cl.** **455/522**; 455/575.5; 455/115.1

(58) **Field of Classification Search** 455/522, 455/456.1, 574, 575.5, 572, 127.1, 115.1, 455/550.1, 300, 301, 569.1, 575.6, 100
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,636,741 A * 1/1987 Mitzlaff 330/127
6,195,562 B1 * 2/2001 Pirhonen et al. 455/553.1
6,408,187 B1 * 6/2002 Merriam 455/458
6,456,856 B1 * 9/2002 Werling et al. 455/575.5
6,498,924 B1 * 12/2002 Vogel et al. 455/67.11
2003/0064761 A1 * 4/2003 Nevermann 455/572
2003/0076168 A1 * 4/2003 Forrester 330/129
2004/0176125 A1 * 9/2004 Lee 455/522
2004/0203345 A1 * 10/2004 Tehrani 455/11.1
2005/0075123 A1 * 4/2005 Jin et al. 455/522
2005/0093624 A1 * 5/2005 Forrester et al. 330/129
2005/0124305 A1 * 6/2005 Stichewlbout 455/117

FOREIGN PATENT DOCUMENTS

EP 0 843 421 A2 5/1998
EP 0 977 304 A1 2/2000
WO WO 98/29968 7/1998
WO WO 02/05443 A2 1/2002

* cited by examiner

Primary Examiner—Sonny Trinh

(57) **ABSTRACT**

A proximity regulation system for use with a portable cell phone and a method of operating the same. In one embodiment, the proximity regulation system includes a location sensing subsystem that is configured to determine a location of the portable cell phone proximate a user. A power governing subsystem is coupled to the location sensing subsystem and configured to determine a proximity transmit power level of the portable cell phone based on the location.

9 Claims, 3 Drawing Sheets

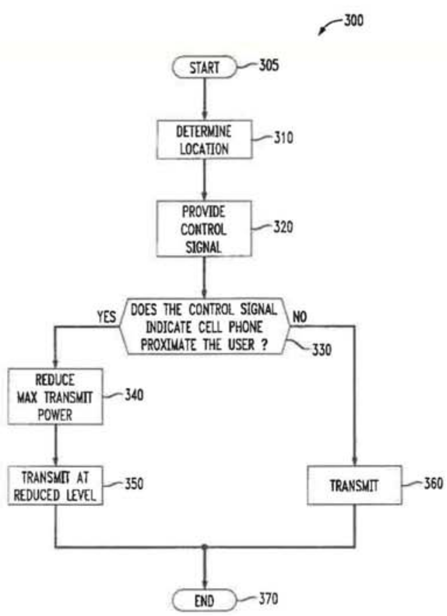


FIG. 1

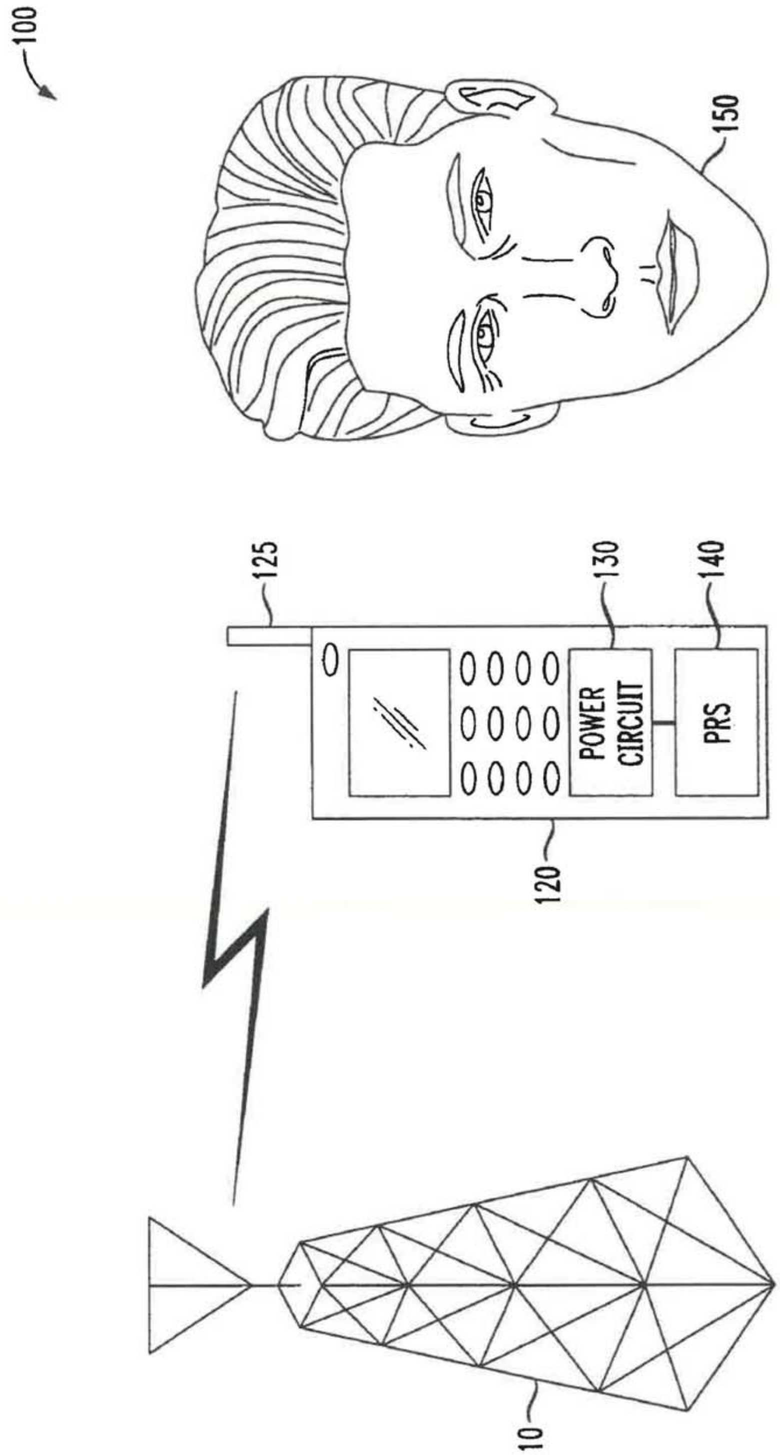


FIG. 2

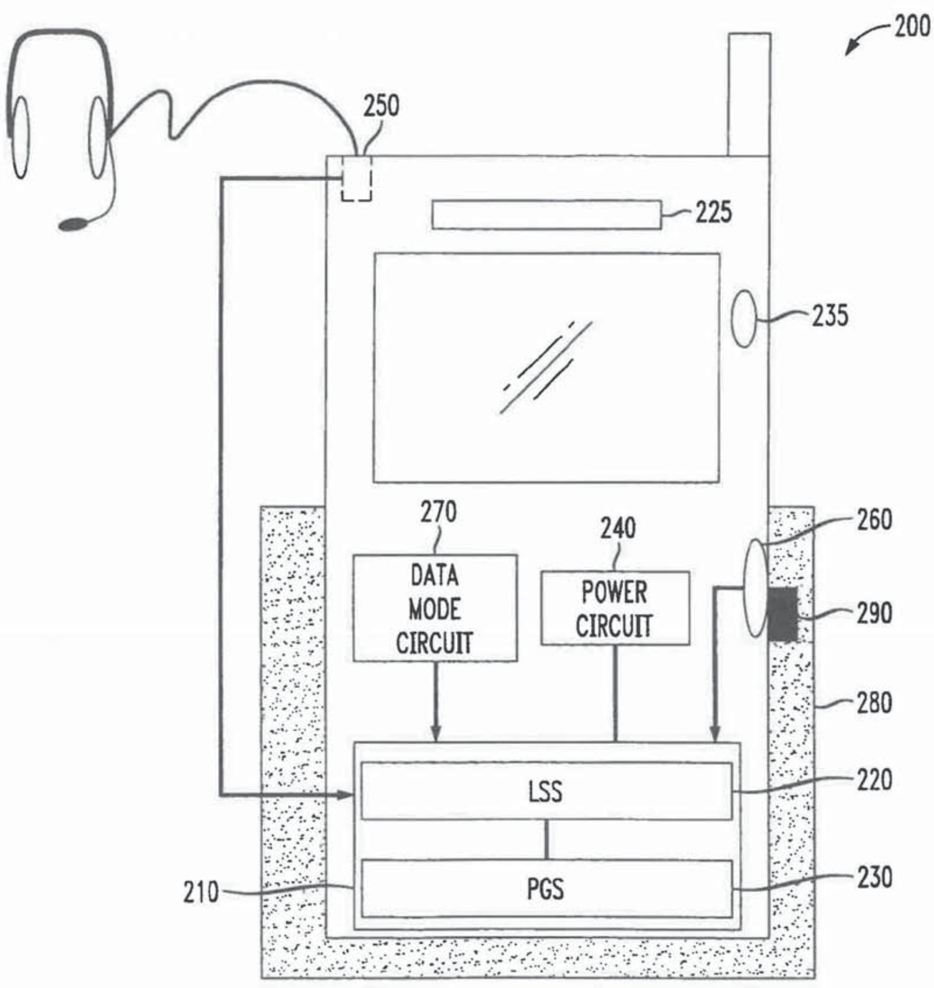
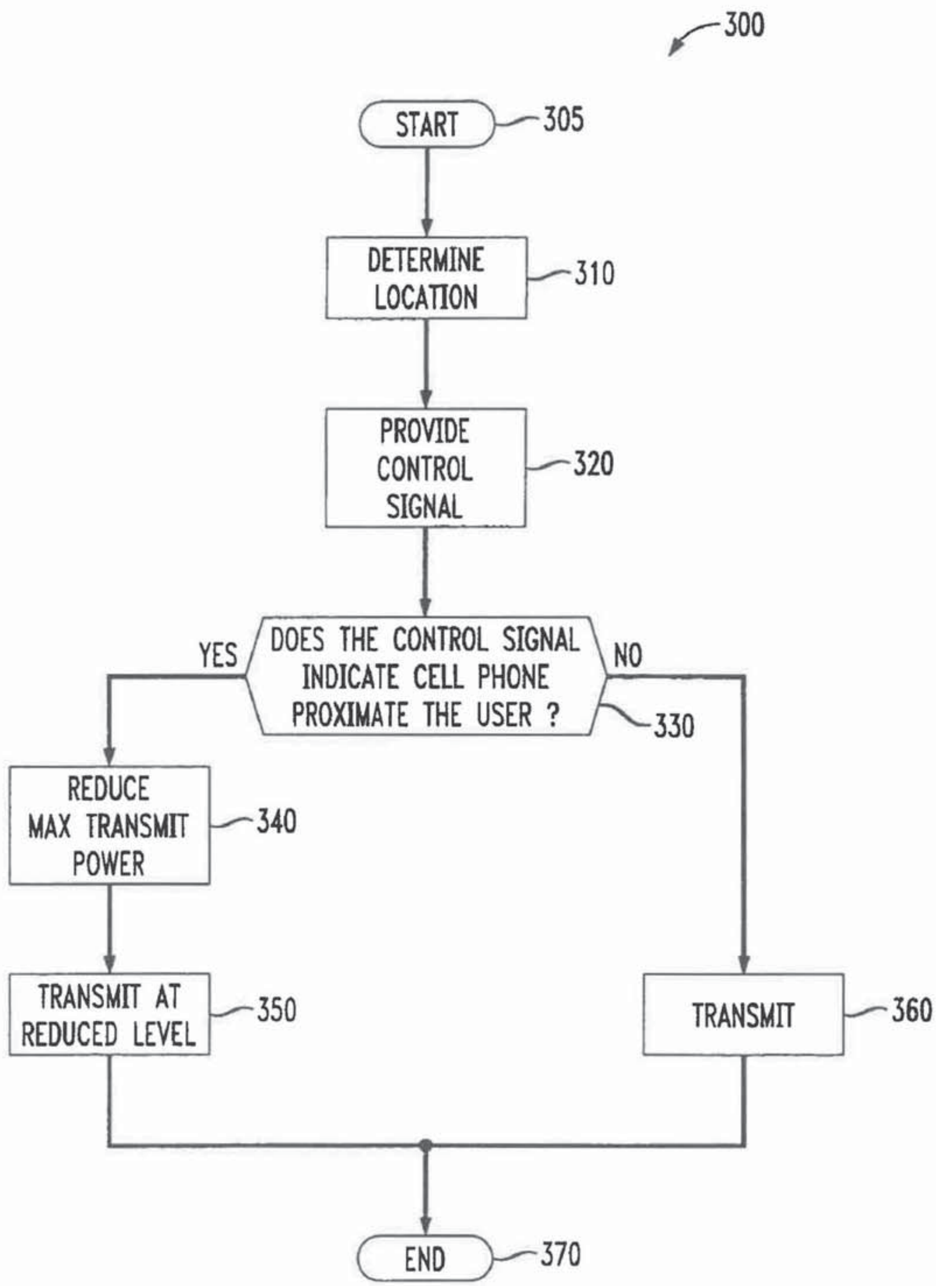

200
250
225
235
270
DATA MODE CIRCUIT
240
POWER CIRCUIT
260
290
280
LSS
220
PGS
210
230

FIG. 3


300
START
305
DETERMINE LOCATION
310
PROVIDE CONTROL SIGNAL
320
DOES THE CONTROL SIGNAL INDICATE CELL PHONE PROXIMATE THE USER ?
YES
NO
330
REDUCE MAX TRANSMIT POWER
340
TRANSMIT AT REDUCED LEVEL
350
TRANSMIT
360
END
370

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

TECHNICAL FIELD OF THE INVENTION

The present invention is directed, in general, to a mobile telecommunications device and, more specifically, to a system and method of determining a proximity transmit power level of a portable cell phone based on a proximity to a user.

BACKGROUND OF THE INVENTION

Since the inception of the wireless or cellular ("cell") phone in the late 1940's, cell phone usage has expanded beyond their utilitarian beginnings. Presently, cell phones are being used in every aspect of business along with every facet of personal life. People of all ages are now using cell phones as the price of cell phones and services decrease. Presently, more than 74 million cell phones are in use in the United States with estimates predicting more than 139 million in a few years. Cell phones are moving beyond communication tools, and are now taking a place in history by weaving themselves into the social fabric by becoming fashion statements and symbols of power and importance.

Along with the increase in usage has come the requests for improved service and communication quality. Consumers are now looking for more than just wireless voice communication but also Internet access, calendars, organizers, and even games. Meanwhile, manufacturers struggle to meet consumer demands for more options and better quality of service.

Typically, the quality of service of a cell phone is proportional to the transmit power level of the cell phone. Though no definite proof has been determined, health concerns have arisen due to the power used to transmit the radio frequency of cell phones when operated close to the body of a cell phone user. For example, when held close to the ear, many users have health concerns about the high levels of radio frequency energy causing damage to brain cells.

Most of the concerns from consumers center around using the cell phone close to the ear or head of a user. New studies, however, have also suggested that cell phone usage may possibly cause stomach cancer when located near the midsection when sending and receiving data text messaging. Cell phone users still want the best possible quality of service from their cell phone. However, health concerns regarding the transmit power of cell phones are now beginning to affect some users.

Manufacturers have tried several options to relieve the fears of consumers. One such option involves permanently reducing the power of the transmitter in cell phones. Though this may be perceived as a safety advantage to some customers, unfortunately, this also reduces the quality of service of the cell phone. Another option for consumers is the use of cell phones with a base that typically allows a higher transmit power level of up to three watts. This may be the case for a cell phone that is permanently mounted, such as in an automobile. These type of cell phones, however, do not allow the flexibility demanded by consumers that is found in the use of a portable cell phone.

Accordingly, what is needed in the art is a system and method to automatically reduce the transmit power level of a portable cell phone when located near a human body thereby decreasing the perception of health risks associated with the use thereof.

SUMMARY OF THE INVENTION

To address the above-discussed deficiencies of the prior art, the present invention provides a proximity regulation system for use with a portable cell phone. In one embodiment, the proximity regulation system includes a location sensing subsystem that is configured to determine a location of the portable cell phone proximate a user. A power governing subsystem is coupled to the location sensing subsystem and configured to determine a proximity transmit power level of the portable cell phone based on the location.

In another aspect, the present invention provides a method of operating a portable cell phone including determining a location of the portable cell phone proximate a user. The method further includes providing a control signal based on the location, and determining a proximity transmit power level of the portable cell phone based on the control signal.

In yet another aspect, the present invention provides a portable cell phone that includes a power circuit as a function of a position to a communications tower and a proximity regulation system. The proximity regulation system includes a location sensing subsystem that determines a location of the portable cell phone proximate a user. The proximity regulation system also includes a power governing subsystem, coupled to the location sensing subsystem, that determines a proximity transmit power level of the portable cell phone based on the location.

The foregoing has outlined, rather broadly, preferred and alternative features of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they can readily use the disclosed conception and specific embodiment as a basis for designing or modifying other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIG. **1** illustrates a network diagram of an embodiment of a cellular telephone network employing a portable cell phone constructed in accordance with the principles of the present invention;

FIG. **2** illustrates a block diagram of an embodiment of a portable cell phone employing a proximity regulation system constructed in accordance with the principles of the present invention; and

FIG. **3** illustrates a flow diagram of an embodiment of a method of operating a portable cell phone constructed in accordance with the principles of the present invention.

DETAILED DESCRIPTION

Referring initially to FIG. **1**, illustrated is a network diagram of an embodiment of a cellular telephone network, generally designated **100**, employing a portable cell phone **120** constructed in accordance with the principles of the present invention. The cellular telephone network **100** includes a communications tower **110** in communication with the portable cell phone **120**, employable by a portable cell phone user **150**. The portable cell phone **120** includes an antenna **125**, a power circuit **130** and a proximity regulation system **140**.

The communications tower **110** is a conventional communications tower that is positioned to communicate with the portable cell phone **120**. The communications tower **110** may provide either analog or digital communications depending on the cellular telephone network **100** being used. For more information regarding communications towers and their use in cellular telephone networks, see "Mobile Communications Engineering: Theory and Applications" by William C. Y. Lee, McGraw Hill (1997), which is incorporated herein by reference.

In the illustrated embodiment, the portable cell phone **120** is a digital cell phone capable of receiving both voice and text messaging. In an alternative embodiment, the portable cell phone **120** may also be capable of using a headset attachment to allow hands-free operation. The portable cell phone **120** may also attach to a belt clip for storage or for use in conjunction with a headset attachment. In addition, the portable cell phone **120** may also allow hands-free operation while stored in a cradle. The cradle may be a conventional cradle, which is constructed to hold or store the portable cell phone **120**.

The antenna **125** is a conventional portable cell phone antenna that provides communications between the portable cell phone **120** and the communications tower **110**. Through the antenna **125**, the portable cell phone **120** sends and receives voice or data communications across the cellular telephone network **100** via the communications tower **110**.

In the illustrated embodiment, the power circuit **130** may be a typical power circuit in the portable cell phone **120** that produces a transmit power level equivalent to, for instance, a maximum transmit power level of one watt. Through communications with the communications tower **110** employing the antenna **125**, the power circuit **130** may also provide a network adjusted transmit power level that is lower than the maximum transmit power level of one watt. The network adjusted transmit power level is based on a transmit signal strength of a communications path between the communications tower **110** and the portable cell phone **120**.

In an advantageous embodiment of the present invention, the power circuit **130** is further coupled to the proximity regulation system **140** that determines a proximity transmit power level of the portable cell phone **120** based on its location proximate the portable cell phone user **150**. Though not illustrated in FIG. **1**, the proximity regulation system **140** includes a location sensing subsystem and a power governing subsystem, which cooperate to determine both the proximity transmit power level and when it may be employed. Both the location sensing subsystem and the power governing subsystem are more fully discussed with respect to FIG. **2**.

The proximity regulation system **140** in the illustrated embodiment, is a dedicated device that is constructed of special-purpose hardware employing a software program, which directs its operation. In an alternative embodiment, the proximity regulation system **140** may be integrated into a power algorithm employing software that controls the power circuit **130**. The proximity regulation system **140** may be installed when the portable cell phone **120** is constructed. Alternatively, the proximity regulation system **140** may be an after market addition to the already constructed portable cell phone **120**. In one embodiment, the proximity regulation system **140** may be installed with a switch that allows the portable cell phone user **150** to disengage the proximity regulation system **140**. In another embodiment, the proximity regulation system **140** may be used with a personal digital assistant or any other portable device that may emit radio frequency energy within the vicinity of a user.

The portable cell phone user **150** is typically anyone who uses a portable cell phone. This, of course, includes children through senior adults. In the illustrated embodiment, the portable cell phone user **150** is using the portable cell phone **120** proximate their head. Alternatively, the portable cell phone user **150** may use the portable cell phone **120** while attached to a belt clip or in conjunction with a headset. In another embodiment, the portable cell phone user **150** may use the portable cell phone **120** for data text messaging. In this case, the portable cell phone **120** may be typically located in front of the portable cell phone user **150** and within a distance of an arm's length. It is also contemplated that the portable cell phone **120** may transmit and receive other forms of multimedia communications such as video.

Turning now to FIG. **2**, illustrated is a block diagram of an embodiment of a portable cell phone, generally designated **200**, employing a proximity regulation system **210** constructed in accordance with the principles of the present invention. The portable cell phone **200** includes the proximity regulation system **210**, a power circuit **240**, a headset operation mode input **250**, a belt clip sensor **260** and a data transfer operation mode circuit **270**. The portable cell phone **200** is attached to a belt clip **280** having a position indicator **290**. The proximity regulation system **210** includes a location sensing subsystem **220** and a power governing subsystem **230**.

The proximity regulation system **210** determines a proximity transmit power level of the portable cell phone **200** based on the location of the portable cell phone **200** proximate a portable cell phone user. In the illustrated embodiment, the proximity regulation system **210** is a dedicated device that is solely hardwired. As discussed above with respect to FIG. **1**, the proximity regulation system **210** is coupled to the power circuit **240**. Additionally, the proximity regulation system **210** is coupled to the headset operation mode input **250**, the belt clip sensor **260** and the data transfer operation mode circuit **270**. Of course, a portable cell phone may still employ the proximity regulation system **210** without the headset operation mode input **250**, the belt clip sensor **260** or the data transfer operation mode circuit **270**.

The location sensing subsystem **220** is coupled to the power governing subsystem **230**, and determines a location of the portable cell phone **200** proximate a user. In the illustrated embodiment, the location sensing subsystem **220** is embodied in an integrated circuit. In another embodiment, the location sensing subsystem **220** may be embodied as a sequence of operating instructions.

In an exemplary embodiment, the location sensing subsystem **220** determines that the portable cell phone **200** is proximate the head of the user if there is no indication that the portable cell phone **200** is in a data transfer operation mode, a headset operation mode or located on a belt clip. In another embodiment, the location sensing subsystem **220** may determine if the portable cell phone **200** is proximate the head of the user through a designated sensor **225** located on the portable cell phone **200**.

The designated sensor **225** may be an inductively coupled loop that changes a surrounding magnetic field when in the vicinity of the user's head. The change in the magnetic field creates a change in the inductive coupling thereby causing an impedance change associated with the inductively coupled loop. The impedance change may affect the current flow in the inductively coupled loop, which can be used to indicate the proximity of the portable cell phone **200** to the user's head.

In an alternative embodiment, the designated sensor **225** may also be a contact sensor that indicates proximity of the portable cell phone **200** to the user's head when the portable cell phone **200** is touching the user's ear. The contact sensor may also indicate proximity of the portable cell phone **200** to the user by contact from the user's hand. One skilled in the pertinent art will understand that other sensors may be used to indicate the proximity of the portable cell phone **200** to the user's body.

In an alternative embodiment, the location sensing subsystem **220** determines that the portable cell phone **200** is proximate the body of the user when receiving an indication from the data transfer operation mode circuit **270**. Additionally, the location sensing subsystem **220** may determine that the portable cell phone **200** is proximate the body of the user if the portable cell phone **200** is located on the belt clip **280** or a headset is inserted in the headset operation mode input **250**. Still, another embodiment may indicate that the portable cell phone **200** is away from the body of the user when the portable cell phone **200** is in a cradle.

The power governing subsystem **230** is coupled to the location sensing subsystem **220**. The power governing subsystem **230** determines the proximity transmit power level of the portable cell phone **200** based on the location of the portable cell phone **200** as determined by the location sensing subsystem **220**. In one embodiment, the network adjusted transmit power level may be reduced to a value determined by the proximity transmit power level when the location of the portable cell phone **200** is within the vicinity of the user's head. In another embodiment, the network adjusted transmit power level may be similarly reduced when the location of the portable cell phone **200** is just within the vicinity of a user's body.

In another embodiment, the proximity transmit power level may match the network adjusted transmit power level, which may be the maximum transmit power level of, for instance, one watt, when the portable cell phone **200** is operating in the headset operation mode or the data transfer mode. In still another embodiment, the proximity transmit power level may be further reduced when the portable cell phone user is a child. A switch **235** may be installed on the portable cell phone **200** to allow this user option. Additionally, the switch **235** may also allow the user to disengage the proximity regulation system **210** whenever desired. In one embodiment, the switch **235** may be a standard software switch that the user controls through a display and a keypad of the portable cell phone **200**.

The headset operation mode input **250** is a conventional receptacle for receiving a headset that allows hands-free operation. As mentioned above, the headset operation mode input **250** is coupled to the proximity regulation system **210**. The location sensing subsystem **220** of the proximity regulation system **210** receives an indication that the headset is in use from the headset operation mode input **250** when a headset is inserted. In one embodiment, the location sensing subsystem **220** determines that the portable cell phone **200** is not within the vicinity of the head of the user upon receiving indication from the headset operation mode input **250**.

In another embodiment, the location sensing subsystem **220** may determine that the portable cell phone **200** is within the vicinity of the user's body if the headset is inserted in the headset operation mode input **250**. In an alternative embodiment, the location sensing subsystem **220** may determine that the headset operation mode input **250** may be used in conjunction with the belt clip sensor **260** to indicate that the portable cell phone **200** is proximate the user's body.

The belt clip sensor **260** is coupled to the proximity regulation system **210** and indicates when the portable cell phone **200** is located within the belt clip **280**. The belt clip sensor **260** may be a contact sensor that is depressed by a protrusion on the belt clip **280** when placed in the belt clip **280**. In an alternative embodiment, the belt clip sensor **260** may use an inductively coupled loop constructed to indicate to the location sensing subsystem **220** that the portable cell phone **200** is in the belt clip **280**.

The data transfer operation mode circuit **270** is coupled to the proximity regulation system **210** and indicates to the location sensing subsystem **220** of the proximity regulation system **210** when the portable cell phone **200** is being used for data text messaging. As mentioned above with respect to the discussion of the antenna **125** of FIG. **1**, the data text messaging may be received from a communications network via an antenna such as those shown in FIG. **1**.

The belt clip **280** is a conventional device for holding the portable cell phone **200**. The belt clip **280** is typically constructed of plastic and constructed to attach to a user's belt. The belt clip **280** may hold the portable cell phone **200** when the user is not using the portable cell phone **200**. In alternative embodiments, the belt clip **280** may hold the portable cell phone **200** when the headset is being employed. In other embodiments, another type of clip may be used by the user to hold the portable cell phone **200**. For example, instead of the belt clip **280**, the user may store the portable cell phone **200** in a clip that attaches to a shirt pocket or an arm band.

The position indicator **290** of the belt clip **280** may be a protrusion that depresses the belt clip sensor **260** on the portable cell phone **200** to indicate to the location sensing subsystem **220** that the portable cell phone **200** is positioned in the belt clip **280**. In an alternative embodiment, the position indicator **290** may be a metallic insert that varies the magnetic field of an inductively coupled loop of the belt clip sensor **260**. It should be noted that other pertinent components not shown may be included within the portable cell phone **200** without departing from the scope of the present invention.

Turning now to FIG. **3**, illustrated is a flow diagram of an embodiment of a method, generally designated **300**, of operating a portable cell phone constructed in accordance with the principles of the present invention. The method **300** starts in a step **305** with an intent to operate a portable cell phone.

Following the step **305**, the portable cell phone determines its location proximate a user in a step **310**. In one embodiment, the location may be determined by a designated sensor that indicates the proximity of the portable cell phone to a user's head. In alternative embodiments, the location may be determined by other sensors including a belt clip sensor, a cradle sensor, or a headset sensor.

After determining proximity to the user, the portable cell phone provides a control signal in a step **320**. The control signal may, for instance, be either a voltage level or current level that is designated to correspond to the previously determined location. Those skilled in the pertinent art will understand the use of control signals to represent a determined condition.

After providing a control signal, the portable cell phone determines if the control signal indicates proximity of the portable cell phone to the user in a first decisional step **330**. In one embodiment, various control signals may be desig-