US008249570B2

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

(10) **Patent No.: US 8,249,570 B2**
(45) **Date of Patent: Aug. 21, 2012**

(54) **APPARATUS, METHOD, AND COMPUTER-READABLE MEDIUM FOR INTERFACING DEVICES WITH COMMUNICATIONS NETWORKS**

(75) Inventors: **Steven Tischer**, Atlanta, GA (US); **Samuel N. Zellner**, Dunwoody, GA (US); **Robert J. Starr**, Decatur, GA (US)

(73) Assignee: **AT&T Intellectual Property I, L.P.**, Atlanta, GA (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 135 days.

(21) Appl. No.: **12/837,785**

(22) Filed: **Jul. 16, 2010**
(Under 37 CFR 1.47)

(65) **Prior Publication Data**

US 2011/0021189 A1 Jan. 27, 2011

**Related U.S. Application Data**

(63) Continuation of application No. 11/323,820, filed on Dec. 30, 2005, now abandoned, which is a continuation-in-part of application No. 10/195,197, filed on Jul. 15, 2002, now Pat. No. 7,194,083.

(51) **Int. Cl.**
*H04L 29/08* (2006.01)

(52) **U.S. Cl.** ............... **455/414.4**; 455/426.2; 455/412.1; 455/411; 370/401; 370/466

(58) **Field of Classification Search** ............... 455/426.1, 455/426.2, 412.1, 414.4, 432.2, 435.2; 370/466; 709/203–206; 379/88.11–88.15
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 3,729,594 | A | 4/1973 | Krock et al. |
| 3,906,166 | A | 9/1975 | Cooper et al. |
| 3,956,596 | A | 5/1976 | Connolly et al. |
| 4,218,590 | A | 8/1980 | Rasmussen et al. |
| 4,268,722 | A | 5/1981 | Little et al. |
| 4,390,963 | A | 6/1983 | Puhl et al. |
| 4,398,265 | A | 8/1983 | Puhl et al. |
| 4,421,952 | A | 12/1983 | Barnes |
| 4,434,461 | A | 2/1984 | Puhl |
| 4,485,486 | A | 11/1984 | Webb et al. |
| 4,486,624 | A | 12/1984 | Puhl et al. |
| 4,528,424 | A | 7/1985 | Middleton et al. |

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0 342 707 11/1989

(Continued)

OTHER PUBLICATIONS

U.S. Official Action dated Jul. 21, 2010 in U.S. Appl. No. 11/323,186.

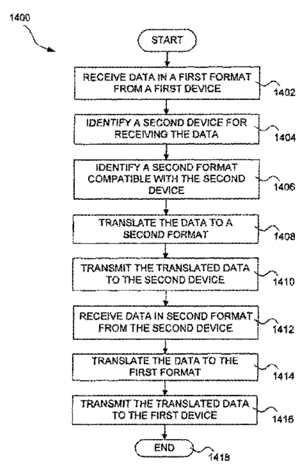
(Continued)

*Primary Examiner* — Sharad Rampuria
(74) *Attorney, Agent, or Firm* — Hope Baldauff Hartman, LLC

(57) **ABSTRACT**

An apparatus, method, and computer-readable medium for interfacing devices with communications networks are provided. According to one aspect, an interface device for providing communications between a first communications network and a device associated with a second communications network comprises one or more inputs, one or more outputs, and logic. The one or more inputs of the interface device receive data in a first format from the first communications network. The logic translates the data to a second format compatible with the second communications device. The translated data is then transmitted to the device associated with the second communications network via the one or more outputs. The first and second formats may comprise rich media content.

**20 Claims, 17 Drawing Sheets**



U.S. PATENT DOCUMENTS

4,549,311 A 10/1985 McLaughlin
4,575,582 A 3/1986 Makino
4,654,655 A 3/1987 Kowalski
4,658,096 A 4/1987 West, Jr. et al.
4,706,274 A 11/1987 Baker et al.
4,734,928 A 3/1988 Weiner et al.
4,737,975 A 4/1988 Shafer
4,737,978 A 4/1988 Burke et al.
4,741,018 A 4/1988 Potratz et al.
4,748,655 A 5/1988 Thrower et al.
4,751,725 A 6/1988 Bonata et al.
4,775,997 A 10/1988 West, Jr. et al.
4,775,998 A 10/1988 Felix et al.
4,775,999 A 10/1988 Williams
4,799,253 A 1/1989 Stern et al.
4,843,621 A 6/1989 Potratz
4,853,951 A 8/1989 Bauer
4,866,762 A 9/1989 Pintar
4,868,519 A 9/1989 Shafer
4,890,315 A 12/1989 Bendixen et al.
4,893,327 A 1/1990 Stern et al.
4,922,486 A 5/1990 Lidinsky et al.
4,922,517 A 5/1990 West, Jr. et al.
5,020,091 A 5/1991 Krolopp et al.
5,020,094 A 5/1991 Rash et al.
5,046,085 A 9/1991 Godsey et al.
5,117,450 A 5/1992 Joglekar et al.
5,134,651 A 7/1992 Ortiz et al.
5,185,779 A 2/1993 Dop et al.
5,222,123 A 6/1993 Brown et al.
D339,809 S 9/1993 Ron
5,257,406 A 10/1993 Ito et al.
5,261,121 A 11/1993 Hashimoto
5,287,322 A 2/1994 Rastegar
5,311,477 A 5/1994 Rastegar
5,323,418 A 6/1994 Ayerst et al.
5,329,578 A 7/1994 Brennan et al.
5,361,297 A 11/1994 Ortiz et al.
5,367,558 A 11/1994 Gillig et al.
5,375,258 A 12/1994 Gillig
D354,749 S 1/1995 Phillips
5,406,588 A 4/1995 Birchler et al.
5,426,689 A 6/1995 Griffith et al.
5,430,719 A 7/1995 Weisser, Jr.
5,430,761 A 7/1995 Bruckert et al.
5,442,680 A 8/1995 Schellinger et al.
5,444,433 A 8/1995 Gropper
5,444,765 A 8/1995 Marui et al.
D362,003 S 9/1995 Claudio
5,469,465 A 11/1995 Birchler et al.
5,469,494 A 11/1995 Ortiz Perez et al.
5,471,670 A 11/1995 Hess et al.
5,475,734 A 12/1995 McDonald et al.
5,475,735 A 12/1995 Williams et al.
5,497,412 A 3/1996 Lannen et al.
5,506,887 A 4/1996 Emery et al.
5,524,061 A 6/1996 Mooney et al.
5,524,137 A * 6/1996 Rhee .......................... 379/88.01
5,528,666 A 6/1996 Weigand et al.
5,530,736 A 6/1996 Comer et al.
5,533,099 A 7/1996 Byrne
5,544,227 A 8/1996 Blust et al.
5,546,444 A 8/1996 Roach, Jr. et al.
5,548,814 A 8/1996 Lorang et al.
5,564,072 A 10/1996 Aguilera et al.
5,574,984 A 11/1996 Reed et al.
5,588,041 A 12/1996 Meyer, Jr. et al.
5,594,782 A 1/1997 Zicker et al.
5,596,625 A 1/1997 LeBlanc
5,598,412 A 1/1997 Griffith et al.
5,608,655 A 3/1997 Moughanni et al.
5,610,910 A 3/1997 Focsaneanu et al.
5,611,049 A 3/1997 Pitts
5,613,213 A 3/1997 Naddell et al.
5,629,976 A 5/1997 Loke et al.
5,631,946 A 5/1997 Campana et al.
5,659,698 A 8/1997 Weng et al.
5,666,487 A * 9/1997 Goodman et al. ............ 709/246
5,668,561 A 9/1997 Perrotta et al.
5,673,304 A 9/1997 Connor et al.
5,675,629 A 10/1997 Raffel et al.
5,689,549 A 11/1997 Bertocci et al.
5,689,803 A 11/1997 Tayloe
5,703,933 A 12/1997 Ghisler
5,706,328 A 1/1998 Williman
5,708,659 A 1/1998 Rostoker et al.
5,715,293 A 2/1998 Mahoney
5,715,296 A 2/1998 Schornack et al.
5,721,732 A 2/1998 Emeott et al.
5,724,656 A 3/1998 Vo et al.
5,742,905 A * 4/1998 Pepe et al. .................... 455/461
5,751,789 A 5/1998 Farris et al.
5,757,902 A 5/1998 Mitsuo
5,758,281 A 5/1998 Emery et al.
5,764,730 A 6/1998 Rabe et al.
5,771,453 A 6/1998 Haartsen
5,771,459 A 6/1998 Demery et al.
5,774,793 A 6/1998 Cooper et al.
5,774,805 A 6/1998 Zicker
5,774,857 A 6/1998 Newlin
5,790,631 A 8/1998 Minarczik et al.
5,798,694 A 8/1998 Reber et al.
5,801,654 A 9/1998 Traylor
5,802,481 A 9/1998 Prieto
5,812,637 A 9/1998 Schornack et al.
5,818,824 A 10/1998 Lu et al.
5,826,034 A 10/1998 Albal
5,826,193 A 10/1998 Ghisler et al.
5,849,433 A 12/1998 Venugopal et al.
5,859,894 A 1/1999 Ortiz Perez et al.
5,875,395 A 2/1999 Holmes
5,877,821 A 3/1999 Newlin et al.
5,878,096 A 3/1999 Shao et al.
5,884,193 A 3/1999 Kaplan
5,898,679 A 4/1999 Brederveld et al.
5,901,359 A 5/1999 Malmstrom
5,903,832 A 5/1999 Seppanen et al.
5,903,833 A 5/1999 Jonsson et al.
5,905,950 A 5/1999 Anell
5,911,120 A 6/1999 Jarett et al.
5,917,434 A 6/1999 Murphy
5,920,596 A 7/1999 Pan et al.
5,920,815 A 7/1999 Akhavan
5,926,760 A 7/1999 Khan et al.
5,937,058 A 8/1999 Bleile et al.
5,946,384 A 8/1999 Yee et al.
5,946,616 A 8/1999 Schornack et al.
5,949,616 A 9/1999 Coon et al.
5,966,428 A 10/1999 Ortiz Perez et al.
5,970,388 A 10/1999 Will
5,978,469 A 11/1999 Benson
5,982,762 A 11/1999 Anzai et al.
5,982,854 A 11/1999 Ehreth
5,983,117 A 11/1999 Sandler et al.
5,987,100 A * 11/1999 Fortman et al. ............ 379/88.14
5,987,678 A 11/1999 Ayers
5,995,839 A 11/1999 Coursey
6,002,937 A 12/1999 Young et al.
6,009,086 A 12/1999 Freeburg et al.
6,014,569 A 1/2000 Bottum
6,016,107 A 1/2000 Kampe et al.
6,016,269 A 1/2000 Peterson et al.
6,018,665 A 1/2000 Chavez et al.
6,026,086 A 2/2000 Lancelot et al.
6,028,984 A 2/2000 Kimball
6,029,072 A 2/2000 Barber
6,031,492 A 2/2000 Griffin et al.
6,035,215 A 3/2000 Goni et al.
6,035,220 A 3/2000 Claudio et al.
6,038,265 A 3/2000 Pan et al.
6,044,148 A 3/2000 Bleile
6,058,106 A 5/2000 Cudak et al.
6,061,439 A 5/2000 Bleile et al.
6,072,828 A 6/2000 Chun
6,072,858 A 6/2000 Bellin
6,072,862 A * 6/2000 Srinivasan ............... 379/100.08
6,072,869 A 6/2000 Becker et al.

6,075,783 A 6/2000 Voit
6,078,805 A 6/2000 Scott
6,080,690 A 6/2000 Lebby et al.
6,114,053 A 9/2000 Matsuyama et al.
6,115,388 A 9/2000 Chinitz et al.
6,115,604 A 9/2000 Lester et al.
6,116,014 A 9/2000 Dalla Betta et al.
6,121,881 A 9/2000 Bieback et al.
6,122,515 A 9/2000 Ito et al.
6,122,531 A 9/2000 Nicholls et al.
6,125,126 A 9/2000 Hallenstang
6,134,235 A 10/2000 Goldman et al.
6,134,314 A 10/2000 Dougherty et al.
6,137,466 A 10/2000 Moughanni et al.
6,138,026 A 10/2000 Irvin
6,141,341 A 10/2000 Jones et al.
6,145,084 A 11/2000 Zuili et al.
6,148,069 A 11/2000 Ekstrom et al.
6,151,500 A 11/2000 Cardina et al.
6,151,620 A 11/2000 Madsen et al.
6,157,545 A 12/2000 Janninck et al.
6,167,271 A 12/2000 Parker et al.
6,167,278 A 12/2000 Nilssen
6,169,988 B1 1/2001 Asakura
6,188,888 B1 2/2001 Bartle et al.
6,192,231 B1 2/2001 Chapman et al.
6,198,947 B1 3/2001 Barber
6,203,192 B1 3/2001 Fortman
6,208,627 B1 3/2001 Menon et al.
6,212,396 B1 4/2001 Brown et al.
6,212,550 B1 4/2001 Segur
6,230,031 B1 5/2001 Barber
6,240,277 B1 5/2001 Bright
6,252,867 B1 6/2001 Pfeil et al.
6,253,088 B1 6/2001 Wenk
6,256,489 B1 7/2001 Lichter et al.
6,259,925 B1 7/2001 Josse
6,272,134 B1 8/2001 Bass et al.
6,282,564 B1 8/2001 Smith et al.
6,295,348 B1 9/2001 Bleile et al.
6,301,474 B1 10/2001 Hartmaier et al.
6,314,299 B1 11/2001 Schreib et al.
6,317,064 B1 11/2001 Ferrer et al.
6,324,410 B1 11/2001 Giacopelli et al.
6,330,247 B1 12/2001 Chang et al.
6,331,972 B1 12/2001 Harris et al.
6,333,919 B2 12/2001 Gaffney
6,339,795 B1 1/2002 Narurkar et al.
6,362,778 B2 3/2002 Neher
6,396,413 B2 5/2002 Hines et al.
6,396,457 B1 5/2002 Gatherer et al.
6,405,027 B1 6/2002 Bell
6,411,802 B1 6/2002 Cardina et al.
6,429,811 B1 8/2002 Zhao et al.
6,434,394 B1 8/2002 Grundvig et al.
6,438,215 B1 8/2002 Skladman et al.
6,442,241 B1 8/2002 Tsumpes
6,449,269 B1 9/2002 Edholm
6,453,154 B1 9/2002 Haber et al.
6,459,688 B1 10/2002 Bursztejn et al.
6,459,776 B1 10/2002 Aktas et al.
6,466,783 B2 10/2002 Dahm et al.
6,466,799 B1 10/2002 Torrey et al.
6,470,028 B1 10/2002 Perry et al.
6,470,187 B1 10/2002 Rosen et al.
6,477,362 B1 11/2002 Raith et al.
6,480,714 B1 11/2002 DePani et al.
6,496,693 B1 12/2002 Tran
6,507,589 B1 1/2003 Ramasubramani et al.
6,515,967 B1 2/2003 Wei et al.
6,526,581 B1 2/2003 Edson
6,529,707 B1 3/2003 Dent
6,529,746 B1 3/2003 Kotzin
6,542,497 B1 4/2003 Curry et al.
6,573,938 B1 6/2003 Schulz et al.
6,577,952 B2 6/2003 Geier et al.
6,600,734 B1 7/2003 Gernert et al.
6,615,056 B1 9/2003 Taylor et al.
6,631,120 B1 10/2003 Milbrandt
6,639,917 B1 10/2003 Ellington et al.
6,643,709 B1 11/2003 Kwon
6,690,923 B1 2/2004 Ortiz Perez et al.
6,701,352 B1 3/2004 Gardner et al.
6,704,317 B1 3/2004 Dobson
6,704,580 B1 3/2004 Fintel
6,707,888 B1 3/2004 Cope
6,714,797 B1 3/2004 Rautila
D490,063 S 5/2004 Miller
D490,066 S 5/2004 Lytel
D490,067 S 5/2004 Haney
6,741,835 B2 5/2004 Pulver
D490,794 S 6/2004 Rathmell
D491,159 S 6/2004 Lytel
6,757,528 B1 6/2004 Cardina et al.
6,775,522 B2 8/2004 Schornack et al.
6,775,552 B2 8/2004 Link, II
6,778,824 B2 8/2004 Wonak et al.
6,781,481 B2 8/2004 Richardson
6,782,003 B1 8/2004 Giroux et al.
6,785,517 B2 8/2004 Schornack et al.
6,788,953 B1 9/2004 Cheah et al.
6,792,095 B1 9/2004 Frank
6,801,159 B2 10/2004 Swope et al.
6,801,793 B1 10/2004 Aarnio et al.
6,801,934 B1 10/2004 Eranko
6,825,762 B2 11/2004 Giacopelli et al.
6,829,501 B2 12/2004 Nielsen et al.
6,832,082 B1 12/2004 Ramaswamy et al.
6,832,093 B1 12/2004 Ranta
6,865,384 B2 3/2005 Sagi et al.
6,900,772 B2 5/2005 Pulver
6,920,144 B2 7/2005 Niermann
6,920,313 B2 7/2005 Trombatore
6,922,170 B2 7/2005 Alexander, Jr.
6,922,432 B2 7/2005 Callaway, Jr. et al.
6,940,820 B2 9/2005 Fang
6,947,738 B2 * 9/2005 Skog et al. ................. 455/426.1
6,950,674 B2 * 9/2005 Jarrett ........................ 455/552.1
6,961,330 B1 11/2005 Cattan et al.
6,961,575 B2 11/2005 Stanforth
6,978,141 B2 12/2005 Smith et al.
6,978,154 B1 12/2005 Ospalak et al.
6,981,045 B1 12/2005 Brooks
6,996,396 B1 2/2006 Snapp
7,003,287 B2 2/2006 Roeder
7,032,115 B2 4/2006 Kashani
7,035,633 B2 4/2006 Kirkpatrick
7,073,129 B1 7/2006 Robarts et al.
7,079,851 B2 7/2006 Makuta
7,085,566 B1 8/2006 Burchard
7,096,491 B2 8/2006 Cheng
7,099,825 B1 8/2006 Cook
7,120,454 B1 10/2006 Frank
7,130,609 B2 10/2006 Cardina et al.
7,130,616 B2 * 10/2006 Janik .......................... 455/412.1
7,133,795 B1 11/2006 Iaciofano et al.
7,136,358 B2 11/2006 Kunito et al.
7,149,514 B1 12/2006 DePani et al.
7,184,768 B2 2/2007 Hind et al.
7,194,083 B1 3/2007 Tischer et al.
7,196,625 B1 3/2007 Nguyen
7,200,424 B2 4/2007 Tischer et al.
7,203,199 B1 4/2007 Duree et al.
7,212,111 B2 5/2007 Tupler et al.
7,218,895 B1 5/2007 Raghavan
7,221,950 B2 5/2007 Frank et al.
7,231,481 B2 6/2007 Scott et al.
7,248,590 B1 7/2007 Liu
7,272,153 B2 9/2007 Cline
7,274,926 B1 * 9/2007 Laumen et al. ............ 455/414.1
7,274,927 B2 9/2007 Olrik
7,280,817 B2 10/2007 Comp
7,283,519 B2 10/2007 Girard
7,284,147 B2 10/2007 Rao et al.
7,289,616 B2 10/2007 Punaganti Venkata et al.
7,308,498 B1 12/2007 Olsen et al.
7,315,553 B2 1/2008 Keller-Tuberg et al.
7,318,099 B2 1/2008 Stahl et al.

| | | | | |
|---|---|---|---|---|
| 7,363,034 | B2 | 4/2008 | DePani et al. | |
| 7,376,386 | B2 * | 5/2008 | Phillips et al. | 455/3.01 |
| 7,392,035 | B2 | 6/2008 | Rahman et al. | |
| 7,440,887 | B2 | 10/2008 | Soulet | |
| 7,460,510 | B2 | 12/2008 | Olivier et al. | |
| 7,467,103 | B1 | 12/2008 | Murray et al. | |
| 7,499,529 | B1 | 3/2009 | Kvache et al. | |
| 7,522,722 | B2 | 4/2009 | Tischer et al. | |
| 7,574,523 | B2 | 8/2009 | Traversat et al. | |
| 7,623,653 | B2 | 11/2009 | Tischer et al. | |
| 7,630,705 | B2 | 12/2009 | Galicia et al. | |
| 7,650,415 | B1 | 1/2010 | Peterson | |
| 2001/0026537 | A1 | 10/2001 | Massey | |
| 2001/0035459 | A1 | 11/2001 | Komai | |
| 2001/0037404 | A1 | 11/2001 | Hafsteinsson et al. | |
| 2001/0040512 | A1 | 11/2001 | Hines et al. | |
| 2001/0041533 | A1 | 11/2001 | Schornack et al. | |
| 2001/0049264 | A1 | 12/2001 | Balech | |
| 2002/0006137 | A1 | 1/2002 | Rabenko et al. | |
| 2002/0016739 | A1 | 2/2002 | Ogasawara | |
| 2002/0021669 | A1 | 2/2002 | Kunito et al. | |
| 2002/0023010 | A1 | 2/2002 | Rittmaster et al. | |
| 2002/0025832 | A1 | 2/2002 | Durian et al. | |
| 2002/0027994 | A1 | 3/2002 | Katayama et al. | |
| 2002/0039892 | A1 | 4/2002 | Lindell | |
| 2002/0044641 | A1 | 4/2002 | Wanner | |
| 2002/0045453 | A1 | 4/2002 | Juttner et al. | |
| 2002/0054667 | A1 | 5/2002 | Martinez | |
| 2002/0065109 | A1 | 5/2002 | Mansikkaniemi et al. | |
| 2002/0068544 | A1 | 6/2002 | Barzilay et al. | |
| 2002/0068558 | A1 | 6/2002 | Janik | |
| 2002/0073416 | A1 | 6/2002 | Ramsey Catan | |
| 2002/0086666 | A1 | 7/2002 | Chen | |
| 2002/0089998 | A1 | 7/2002 | Le | |
| 2002/0093948 | A1 | 7/2002 | Dertz et al. | |
| 2002/0094776 | A1 | 7/2002 | Pulver | |
| 2002/0098874 | A1 | 7/2002 | Zirul et al. | |
| 2002/0123359 | A1 | 9/2002 | Wei et al. | |
| 2002/0137498 | A1 | 9/2002 | Goss et al. | |
| 2002/0146977 | A1 | 10/2002 | Schornack et al. | |
| 2002/0151327 | A1 | 10/2002 | Levitt | |
| 2002/0156626 | A1 | 10/2002 | Hutchison | |
| 2002/0160748 | A1 | 10/2002 | Rahman et al. | |
| 2002/0184517 | A1 | 12/2002 | Tadayon et al. | |
| 2003/0005135 | A1 | 1/2003 | Inoue et al. | |
| 2003/0006913 | A1 | 1/2003 | Joyce et al. | |
| 2003/0008680 | A1 | 1/2003 | Huh et al. | |
| 2003/0041000 | A1 | 2/2003 | Zajac et al. | |
| 2003/0050062 | A1 * | 3/2003 | Chen et al. | 455/435 |
| 2003/0060231 | A1 | 3/2003 | Bozionek et al. | |
| 2003/0063714 | A1 | 4/2003 | Stumer et al. | |
| 2003/0074672 | A1 | 4/2003 | Daniels | |
| 2003/0076672 | A1 | 4/2003 | Head | |
| 2003/0078029 | A1 | 4/2003 | Petite | |
| 2003/0096600 | A1 | 5/2003 | Lewis et al. | |
| 2003/0108189 | A1 | 6/2003 | Barzani | |
| 2003/0125023 | A1 | 7/2003 | Fishler | |
| 2003/0128115 | A1 | 7/2003 | Giacopelli et al. | |
| 2003/0134661 | A1 | 7/2003 | Rudd et al. | |
| 2003/0137991 | A1 | 7/2003 | Doshi et al. | |
| 2003/0142798 | A1 | 7/2003 | Gavette et al. | |
| 2003/0145228 | A1 | 7/2003 | Suuronen et al. | |
| 2003/0156660 | A1 | 8/2003 | Zoltowski et al. | |
| 2003/0171095 | A1 | 9/2003 | Fujinami | |
| 2003/0172121 | A1 | 9/2003 | Evans et al. | |
| 2003/0172218 | A1 | 9/2003 | Scott et al. | |
| 2003/0190018 | A1 | 10/2003 | Bleile et al. | |
| 2003/0208651 | A1 | 11/2003 | Wurzburg | |
| 2003/0216134 | A1 | 11/2003 | Mutoh | |
| 2003/0231594 | A1 | 12/2003 | Xu et al. | |
| 2003/0235219 | A1 | 12/2003 | Kapadia et al. | |
| 2003/0236091 | A1 | 12/2003 | Wonak et al. | |
| 2004/0024660 | A1 | 2/2004 | Ganesh et al. | |
| 2004/0045096 | A1 | 3/2004 | Mani et al. | |
| 2004/0067770 | A1 | 4/2004 | King et al. | |
| 2004/0095316 | A1 | 5/2004 | Shibamiya et al. | |
| 2004/0132438 | A1 | 7/2004 | White | |
| 2004/0160372 | A1 | 8/2004 | Pulver | |
| 2004/0165681 | A1 | 8/2004 | Mohan | |
| 2004/0174901 | A1 | 9/2004 | Ghori et al. | |
| 2004/0177310 | A1 | 9/2004 | Mohan et al. | |
| 2004/0178905 | A1 | 9/2004 | Dernier et al. | |
| 2004/0203639 | A1 | 10/2004 | Ozer et al. | |
| 2004/0203705 | A1 | 10/2004 | Lundby | |
| 2004/0203745 | A1 | 10/2004 | Cooper | |
| 2004/0203942 | A1 | 10/2004 | Dehlin | |
| 2004/0205650 | A1 | 10/2004 | Cheng | |
| 2004/0208119 | A1 | 10/2004 | Christodoulou et al. | |
| 2004/0214569 | A1 | 10/2004 | Cardina et al. | |
| 2004/0236999 | A1 | 11/2004 | Bezuidenhout | |
| 2004/0240647 | A1 | 12/2004 | Tiliks et al. | |
| 2004/0252675 | A1 | 12/2004 | Lund | |
| 2004/0253945 | A1 | 12/2004 | Janik | |
| 2004/0266418 | A1 | 12/2004 | Kotzin | |
| 2004/0267535 | A1 | 12/2004 | Kotzin | |
| 2005/0002407 | A1 | 1/2005 | Shaheen et al. | |
| 2005/0021818 | A1 | 1/2005 | Singhal et al. | |
| 2005/0025299 | A1 | 2/2005 | Tischer et al. | |
| 2005/0025305 | A1 | 2/2005 | Tischer et al. | |
| 2005/0025308 | A1 | 2/2005 | Tischer et al. | |
| 2005/0032435 | A1 | 2/2005 | Tischer et al. | |
| 2005/0032549 | A1 | 2/2005 | Kawaguchi | |
| 2005/0037751 | A1 | 2/2005 | Kim et al. | |
| 2005/0043068 | A1 | 2/2005 | Shohara et al. | |
| 2005/0075093 | A1 | 4/2005 | Lei et al. | |
| 2005/0099959 | A1 | 5/2005 | Standridge | |
| 2005/0107109 | A1 | 5/2005 | Gunaratnam et al. | |
| 2005/0113045 | A1 | 5/2005 | Santhoff et al. | |
| 2005/0124319 | A1 | 6/2005 | Williams et al. | |
| 2005/0129224 | A1 | 6/2005 | Piket et al. | |
| 2005/0129225 | A1 | 6/2005 | Piket et al. | |
| 2005/0129226 | A1 | 6/2005 | Piket et al. | |
| 2005/0143016 | A1 | 6/2005 | Becker et al. | |
| 2005/0143017 | A1 | 6/2005 | Lopp et al. | |
| 2005/0143149 | A1 | 6/2005 | Becker et al. | |
| 2005/0143671 | A1 | 6/2005 | Hastings et al. | |
| 2005/0146431 | A1 | 7/2005 | Hastings et al. | |
| 2005/0147119 | A1 | 7/2005 | Tofano | |
| 2005/0148890 | A1 | 7/2005 | Hastings | |
| 2005/0151640 | A1 | 7/2005 | Hastings | |
| 2005/0180397 | A1 | 8/2005 | Yeom | |
| 2005/0191991 | A1 | 9/2005 | Owen et al. | |
| 2005/0193131 | A1 | 9/2005 | Bai et al. | |
| 2005/0195855 | A1 | 9/2005 | Buskirk et al. | |
| 2005/0200492 | A1 | 9/2005 | Woodard et al. | |
| 2005/0202825 | A1 | 9/2005 | Puranik et al. | |
| 2005/0232284 | A1 | 10/2005 | Karaoguz et al. | |
| 2005/0245241 | A1 | 11/2005 | Durand et al. | |
| 2005/0261970 | A1 | 11/2005 | Vucina et al. | |
| 2005/0271080 | A1 | 12/2005 | Gorman | |
| 2005/0282536 | A1 | 12/2005 | McClure et al. | |
| 2006/0059096 | A1 | 3/2006 | Dublish et al. | |
| 2006/0078292 | A1 | 4/2006 | Huang et al. | |
| 2006/0133414 | A1 | 6/2006 | Luoma et al. | |
| 2006/0143266 | A1 | 6/2006 | Ohto et al. | |
| 2006/0160571 | A1 | 7/2006 | DePani et al. | |
| 2006/0167985 | A1 | 7/2006 | Albanese et al. | |
| 2006/0187956 | A1 | 8/2006 | Doviak et al. | |
| 2006/0195554 | A1 | 8/2006 | Payne et al. | |
| 2006/0209745 | A1 | 9/2006 | MacMullan et al. | |
| 2006/0251115 | A1 | 11/2006 | Haque et al. | |
| 2007/0014307 | A1 | 1/2007 | Srinivasan et al. | |
| 2007/0017976 | A1 | 1/2007 | Peyret et al. | |
| 2007/0054660 | A1 | 3/2007 | Cardina et al. | |
| 2007/0094279 | A1 | 4/2007 | Mittal et al. | |
| 2007/0121651 | A1 * | 5/2007 | Casey et al. | 370/401 |
| 2007/0127644 | A1 | 6/2007 | Tischer et al. | |
| 2007/0178900 | A1 | 8/2007 | Frank | |
| 2007/0268922 | A1 | 11/2007 | Dougan et al. | |
| 2007/0291921 | A1 | 12/2007 | Fleischer et al. | |
| 2008/0020734 | A1 | 1/2008 | Smith et al. | |
| 2008/0192768 | A1 | 8/2008 | Tischer et al. | |
| 2008/0228600 | A1 | 9/2008 | Treyz et al. | |
| 2008/0301231 | A1 | 12/2008 | Mehta et al. | |
| 2008/0317063 | A1 * | 12/2008 | Enzmann et al. | 370/466 |
| 2011/0026436 | A1 | 2/2011 | Karaoguz et al. | |

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| GB | 2 253 119 | 8/1992 |
| GB | 2 283 881 | 5/1995 |
| GB | 2 285 556 | 7/1995 |
| WO | WO 98/28929 | 7/1998 |
| WO | WO 01/58181 | 8/2001 |

OTHER PUBLICATIONS

U.S. Official Action dated Sep. 14, 2010 in U.S. Appl. No. 12/759,767.
U.S. Official Action dated Sep. 29, 2010 in U.S. Appl. No. 11/637,264.
U.S. Official Action dated Sep. 30, 2010 in U.S. Appl. No. 12/874,450.
U.S. Official Action dated Oct. 14, 2010 in U.S. Appl. No. 12/642,288.
U.S. Notice of Allowance / Allowability dated Jun. 21, 2002 in U.S. Appl. No. 09/126,268.
U.S. Notice of Allowance / Allowability dated Oct. 23, 2001 in U.S. Appl. No. 09/268,591.
U.S. Notice of Allowance / Allowability dated Mar. 23, 2005 in U.S. Appl. No. 09/999,806.
U.S. Notice of Allowance / Allowability dated Apr. 5, 2006 in U.S. Appl. No. 09/999,806.
U.S. Notice of Allowance / Allowability dated Aug. 7, 2006 in U.S. Appl. No. 09/999,806.
U.S. Notice of Allowance / Allowability dated Jan. 4, 2005 in U.S. Appl. No. 10/036,206.
U.S. Notice of Allowance / Allowability dated Sep. 7, 2005 in U.S. Appl. No. 10/036,206.
U.S. Notice of Allowance / Allowability dated Apr. 6, 2006 in U.S. Appl. No. 10/036,206.
U.S. Notice of Allowance / Allowability dated Feb. 24, 2004 in U.S. Appl. No. 10/055,212.
U.S. Notice of Allowance / Allowability dated Jul. 3, 2006 in U.S. Appl. No. 10/851,932.
U.S. Notice of Allowance / Allowability dated Aug. 6, 2009 in U.S. Appl. No. 10/929,317.
U.S. Notice of Allowance / Allowability dated Sep. 23, 2009 in U.S. Appl. No. 10/929,715.
U.S. Notice of Allowance / Allowability dated Feb. 23, 2007 in U.S. Appl. No. 11/048,132.
U.S. Notice of Allowance / Allowability dated Jul. 26, 2007 in U.S. Appl. No. 11/332,532.
U.S. Notice of Allowance / Allowability dated Oct. 23, 2007 in U.S. Appl. No. 11/332,532.
U.S. Official Action dated Oct. 1, 2009 in U.S. Appl. No. 11/323,180.
U.S. Official Action dated May 13, 2010 in U.S. Appl. No. 11/323,180.
U.S. Official Action dated Aug. 20, 2009 in U.S. Appl. No. 11/323,181.
U.S. Official Action dated Oct. 23, 2009 in U.S. Appl. No. 11/323,185.
U.S. Official Action dated Jun. 3, 2010 in U.S. Appl. No. 11/323,185.
U.S. Official Action dated Oct. 1, 2009 in U.S. Appl. No. 11/323,186.
U.S. Official Action dated Sep. 11, 2009 in U.S. Appl. No. 11/323,818.
U.S. Official Action dated Mar. 14, 2008 in U.S. Appl. No. 11/323,820.
U.S. Official Action dated Nov. 17, 2008 in U.S. Appl. No. 11/323,820.
U.S. Official Action dated Apr. 22, 2009 in U.S. Appl. No. 11/323,820.
U.S. Official Action dated Nov. 10, 2009 in U.S. Appl. No. 11/323,820.
U.S. Notice of Allowance / Allowability dated Apr. 16, 2010 in U.S. Appl. No. 11/323,820.
U.S. Official Action dated Dec. 16, 2009 in U.S. Appl. No. 11/323,825.
U.S. Notice of Allowance / Allowability dated Sep. 18, 2009 in U.S. Appl. No. 11/324,033.
U.S. Official Action dated Nov. 30, 2009 in U.S. Appl. No. 11/324,034.
U.S. Official Action dated Jul. 7, 2010 in U.S. Appl. No. 11/323,034.
U.S. Official Action dated Oct. 5, 2009 in U.S. Appl. No. 11/324,154.
U.S. Official Action dated May 11, 2010 in U.S. Appl. No. 11/324,154.
U.S. Official Action dated Sep. 18, 2008 in U.S. Appl. No. 11/637,264.
U.S. Official Action dated Sep. 30, 2009 in U.S. Appl. No. 11/637,264.
U.S. Official Action dated Oct. 15, 2009 in U.S. Appl. No. 11/733,525.
U.S. Official Action dated Apr. 16, 2010 in U.S. Appl. No. 11/733,525.
U.S. Official Action dated Jul. 7, 2010 in U.S. Appl. No. 12/639,448.
(Spec Sheet) AdvanceTec—AdvanceCommunicator®—Nokia Product Sheet; printed Jan. 2006, 1 page.
(Spec Sheet) AdvanceTec—OEM Services; AdvanceTec—The Company; printed Jan. 2006, 1 page.
(Spec Sheet) Bluetooth Enabled Technology; ELBT595; printed Jan. 2006, 1 page.
(Spec Sheet) Cell Antenna—Introducing CELLDOCK; Mar. 16, 2005, 1 page.
(Spec Sheet) MERGE by Cidco Communications—Merge for Motorola®; Design & Engineering Showcase Honors 2004; printed Jan. 2006, 2 pages.
(Spec Sheet) Motorola SD 4505 System Expansion Cellular Phone Docking Station; page last updated Apr. 12, 2005; 1 page.
(Spec Sheet) RCA 23200RE3—RCA Multi-Handset cell Docking System; Revised Jun. 6, 2005; 2 pages.
AdvanceTec, The AdvanceTec Solution, Cellular Hands-Free Solution: The Pro-Installed Hands Free, printed Jan. 2006, 4 pages.
CellAntenna Corporation: Cellular Antennas, accessories, cellphone products, www.cellantenna.com; CellAntenna Corporation; printed Sep. 26, 2002.
Cellsocket, Welcome to WHP Wireless, www.libretel.net/welcome.html; printed Aug. 17, 2005; 1 page.
CellSocket, www.cellantenna.com/Dockingstations/cellsocket.htm; Cell Antenna Corporation, printed Sep. 26, 2002.
Cellular Docking Station for Nokia Motorola Star Teac and Erickson Cellular Phones, www.cellantenna.com/Dockingstations/dockingstations.htm, CellAntenna Corporation, Sep. 26, 2002.
http://www.hometoys.com/news.php4?section=enchanced-view&id=17792169; printed Aug. 17, 2005; 3 pages.
MercuryNews.com, Dock makes cell convenient at home, Jul. 25, 2005, www.timesleader.com/m1d/timesleader/business/technology/12216277.htm, printed Aug. 17, 2005; 4 pages.
Motorola, SD4505—Cell phone dock module for SD4500 Series, printed Aug. 17, 2005, pp. 1-2.
PhoneLabs, PhoneLabs Products, printed Aug. 17, 2005, pp. 1-2.
RCA Communications, RCA Cell Docking System 23200RE3, printed Aug. 17, 2005, pp. 1-2.
RCA, Innovative RCA Cell Docking System Allows cell Users to Make and Receive Calls Through a Home Phone, printed Aug. 17, 2005, pp. 1-3.
Telular Corporation—2004 Annual Report, Making Wireline Replacement a Reality, 2004, 76 pages.
Thomson Group, Annual Report, Jun. 3, 2005, pp. 1-180.
Thomson Group, Index to Consolidated Financial Statement, Jun. 3, 2005, Fl-F7, 150 pages total.
VOX2 Cellphone Base Station Model No. 131, Vox.Link User Guide, Rev. 1.02., printed Jan. 2006, 1 page.
VOX2 Voxlink Cellphone Docking Station, www.cellantenna.com/Dockingstations/VOX2dockingstation.htm; CellAntenna Corporation, printed Sep. 26, 2002.
U.S. Official Action dated Nov. 9, 2000 in U.S. Appl. No. 09/126,268.
U.S. Official Action dated Jul. 5, 2001 in U.S. Appl. No. 09/126,268.
U.S. Official Action dated Oct. 25, 2000 in U.S. Appl. No. 09/268,591.
U.S. Official Action dated May 1, 2001 in U.S. Appl. No. 09/268,591.
U.S. Official Action dated Jul. 7, 2004 in U.S. Appl. No. 09/999,806.
U.S. Official Action dated Nov. 30, 2005 in U.S. Appl. No. 09/999,806.

U.S. Official Action dated Sep. 23, 2004 in U.S. Appl. No. 10/195,197.
U.S. Official Action dated May 25, 2005 in U.S. Appl. No. 10/195,197.
U.S. Official Action dated Dec. 16, 2005 in U.S. Appl. No. 10/195,197.
U.S. Official Action dated Apr. 28, 2006 in U.S. Appl. No. 10/195,197.
U.S. Notice of Allowance / Allowability dated Jan. 4, 2007 in U.S. Appl. No. 10/195,197.
U.S. Official Action dated Jan. 28, 2004 in U.S. Appl. No. 10/036,206.
U.S. Official Action dated Jul. 19, 2004 in U.S. Appl. No. 10/036,206.
U.S. Official Action dated May 5, 2005 in U.S. Appl. No. 10/036,206.
U.S. Official Action dated Dec. 23, 2005 in U.S. Appl. No. 10/036,206.
U.S. Official Action dated Aug. 15, 2003 in U.S. Appl. No. 10/055,212.
U.S. Official Action dated Mar. 6, 2008 in U.S. Appl. No. 10/929,317.
U.S. Official Action dated Dec. 9, 2008 in U.S. Appl. No. 10/929,317.
U.S. Official Action dated Apr. 26, 2006 in U.S. Appl. No. 10/929,711.
U.S. Notice of Allowance / Allowability dated Oct. 30, 2006 in U.S. Appl. No. 10/929,711.
U.S. Official Action dated Mar. 6, 2008 in U.S. Appl. No. 10/929,712.
U.S. Notice of Allowance / Allowability dated Dec. 15, 2008 in U.S. Appl. No. 10/929,712.
U.S. Official Action dated Mar. 5, 2008 in U.S. Appl. No. 10/929,715.
U.S. Official Action dated Jun. 19, 2008 in U.S. Appl. No. 10/929,715.
U.S. Official Action dated Apr. 13, 2009 in U.S. Appl. No. 10/929,715.
U.S. Official Action dated Nov. 30, 2005 in U.S. Appl. No. 11/048,132.
U.S. Official Action dated Jun. 20, 2006 in U.S. Appl. No. 11/048,132.
U.S. Official Action dated Apr. 11, 2007 in U.S. Appl. No. 11/322,532.
U.S. Official Action dated Oct. 7, 2008 in U.S. Appl. No. 11/323,180.
U.S. Official Action dated May 12, 2009 in U.S. Appl. No. 11/323,180.
U.S. Official Action dated Jan. 23, 2008 in U.S. Appl. No. 11/323,181.
U.S. Official Action dated Sep. 30, 2008 in U.S. Appl. No. 11/323,181.
U.S. Official Action dated Feb. 19, 2009 in U.S. Appl. No. 11/323,181.
U.S. Official Action dated Jan. 16, 2009 in U.S. Appl. No. 11/323,182.
U.S. Official Action dated Jul. 20, 2009 in U.S. Appl. No. 11/323,182.
U.S. Official Action dated Oct. 30, 2008 in U.S. Serial No. 11/323,185.
U.S. Official Action dated May 18, 2009 in U.S. Appl. No. 11/323,185.
U.S. Official Action dated Oct. 15, 2008 in U.S. Appl. No. 11/323,186.
U.S. Official Action dated May 12, 2009 in U.S. Appl. No. 11/323,186.
U.S. Official Action dated Jan. 21, 2009 in U.S. Appl. No. 11/323,818.
U.S. Official Action dated Apr. 1, 2008 in U.S. Appl. No. 11/323,825.
U.S. Official Action dated Sep. 16, 2008 in U.S. Appl. No. 11/323,825.
U.S. Official Action dated Mar. 5, 2009 in U.S. Appl. No. 11/323,825.
U.S. Official Action dated Jun. 23, 2009 in U.S. Appl. No. 11/323,825.
U.S. Official Action dated Mar. 17, 2008 in U.S. Appl. No. 11/324,033.
U.S. Official Action dated Dec. 23, 2008 in U.S. Appl. No. 11/324,033.
U.S. Official Action dated Jun. 2, 2009 in U.S. Appl. No. 11/324,033.
U.S. Official Action dated Mar. 28, 2008 in U.S. Appl. No. 11/324,034.
U.S. Official Action dated Oct. 3, 2008 in U.S. Appl. No. 11/324,034.
U.S. Official Action dated Apr. 14, 2009 in U.S. Appl. No. 11/324,034.
U.S. Official Action dated Feb. 5, 2009 in U.S. Appl. No. 11/324,149.
U.S. Official Action dated Jul. 22, 2009 in U.S. Appl. No. 11/324,149.
U.S. Official Action dated Mar. 11, 2008 in U.S. Appl. No. 11/324,154.
U.S. Official Action dated Dec. 30, 2008 in U.S. Appl. No. 11/324,154.
U.S. Official Action dated Jul. 9, 2009 in U.S. Appl. No. 11/324,154.
U.S. Official Action dated Jul. 6, 2007 in U.S. Appl. No. 11/637,264.
U.S. Official Action dated Apr. 8, 2008 in U.S. Appl. No. 11/637,264.
U.S. Official Action dated May 13, 2009 in U.S. Appl. No. 11/637,264.
U.S. Official Action dated Oct. 29, 2010 in U.S. Appl. No. 12/640,073.
U.S. Official Action dated Nov. 22, 2010 in U.S. Appl. No. 12/639,313.
U.S. Official Action dated Jan. 19, 2011 in U.S. Appl. No. 11/324,034.
U.S. Final Official Action dated Oct. 27, 2010 in U.S. Appl. No. 11/733,525.
U.S. Final Official Action dated Feb. 4, 2011 in U.S. Appl. No. 12/639,448.
U.S. Final Official Action dated Mar. 2, 2011 in U.S. Appl. No. 12/759,767.
U.S. Notice of Allowance dated Dec. 27, 2010 in U.S. Appl. No. 11/637,264.
U.S. Official Action dated Feb. 7, 2011 in U.S. Appl. No. 11/952,510.
U.S. Notice of Allowance dated Mar. 8, 2011 in U.S. Appl. No. 12/639,313.
U.S. Final Official Action dated Mar. 11, 2011 in U.S. Appl. No. 12/640,073.
U.S. Notice of Allowance dated Apr. 15, 2011 in U.S. Appl. No. 11/637,264.
U.S. Notice of Allowance dated Apr. 14, 2011 in U.S. Appl. No. 12/639,313.
U.S. Official Action dated Mar. 21, 2011 in U.S. Appl. No. 12/642,288.
U.S. Official Action dated Apr. 13, 2011 in U.S. Appl. No. 12/874,450.
U.S. Notice of Allowance dated May 17, 2011 in U.S. Appl. No. 12/639,448.
U.S. Official Action dated Jun. 17, 2011 in U.S. Appl. No. 12/642,288.
U.S. Notice of Allowance dated Nov. 14, 2011 in U.S. Appl. No. 12/642,288.
U.S. Office Action dated Jan. 30, 2012 in U.S. Appl. No. 11/952,510.
U.S. Office Action dated Feb. 3, 2012 in U.S. Appl. No. 12/909,145.
U.S. Official Action dated Aug. 19, 2011 in U.S. Appl. No. 12/909,145.
U.S. Official Action dated Sep. 14, 2011 in U.S. Appl. No. 11/952,510.
U.S. Official Action dated May 4, 2012 in U.S. Appl. No. 13/089,577.
U.S. Official Action dated May 22, 2012 in U.S. Appl. No. 12/874,450.
U.S. Official Action dated Jun, 11, 2012 in U.S. Appl. No. 12/909,145.
U.S. Official Action dated Jun. 26, 2012 in U.S. Appl. No. 12/759,767.
US 6,876,861, 04/2005, Frank et al. (withdrawn)

* cited by examiner

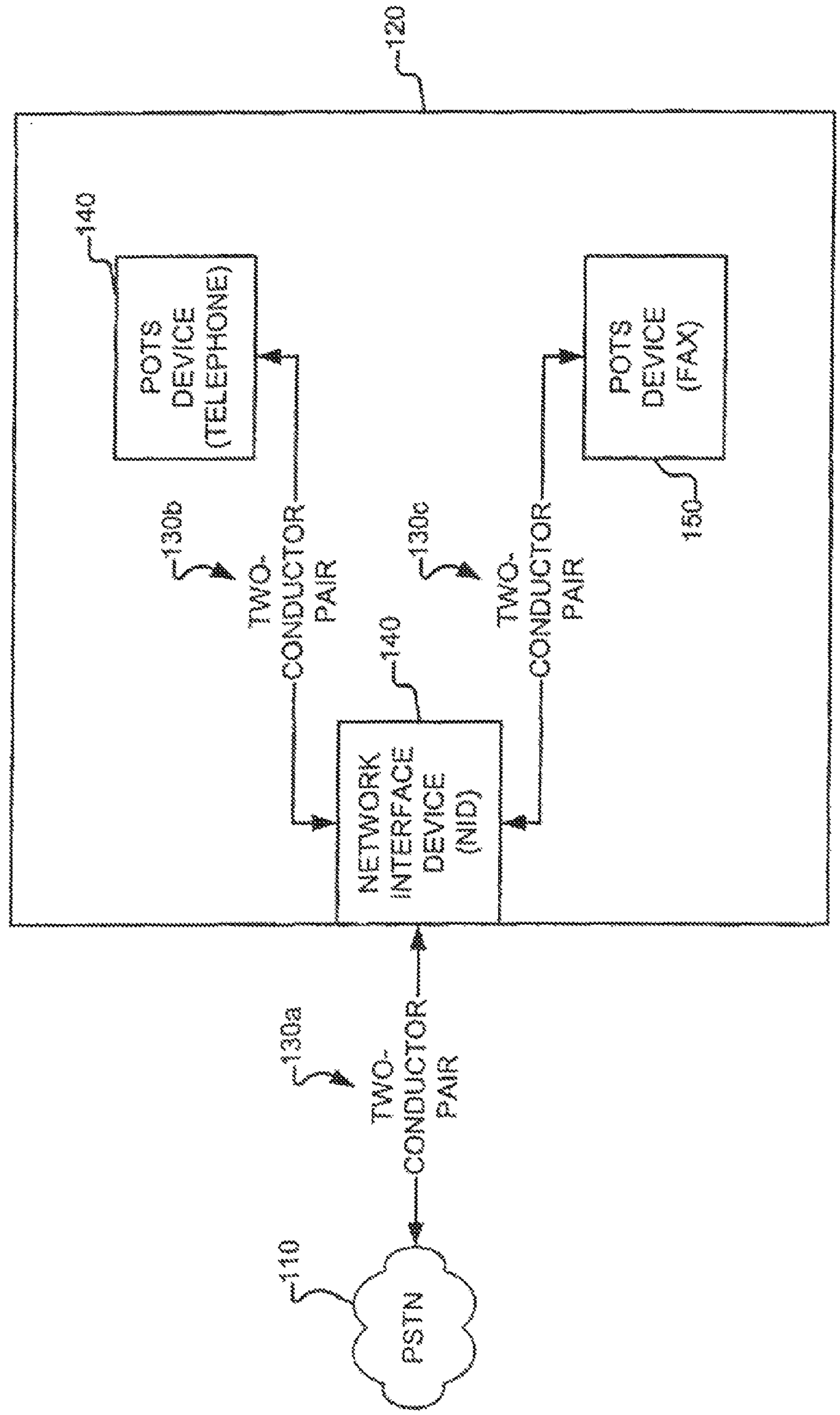



FIG. 1
(PRIOR ART)

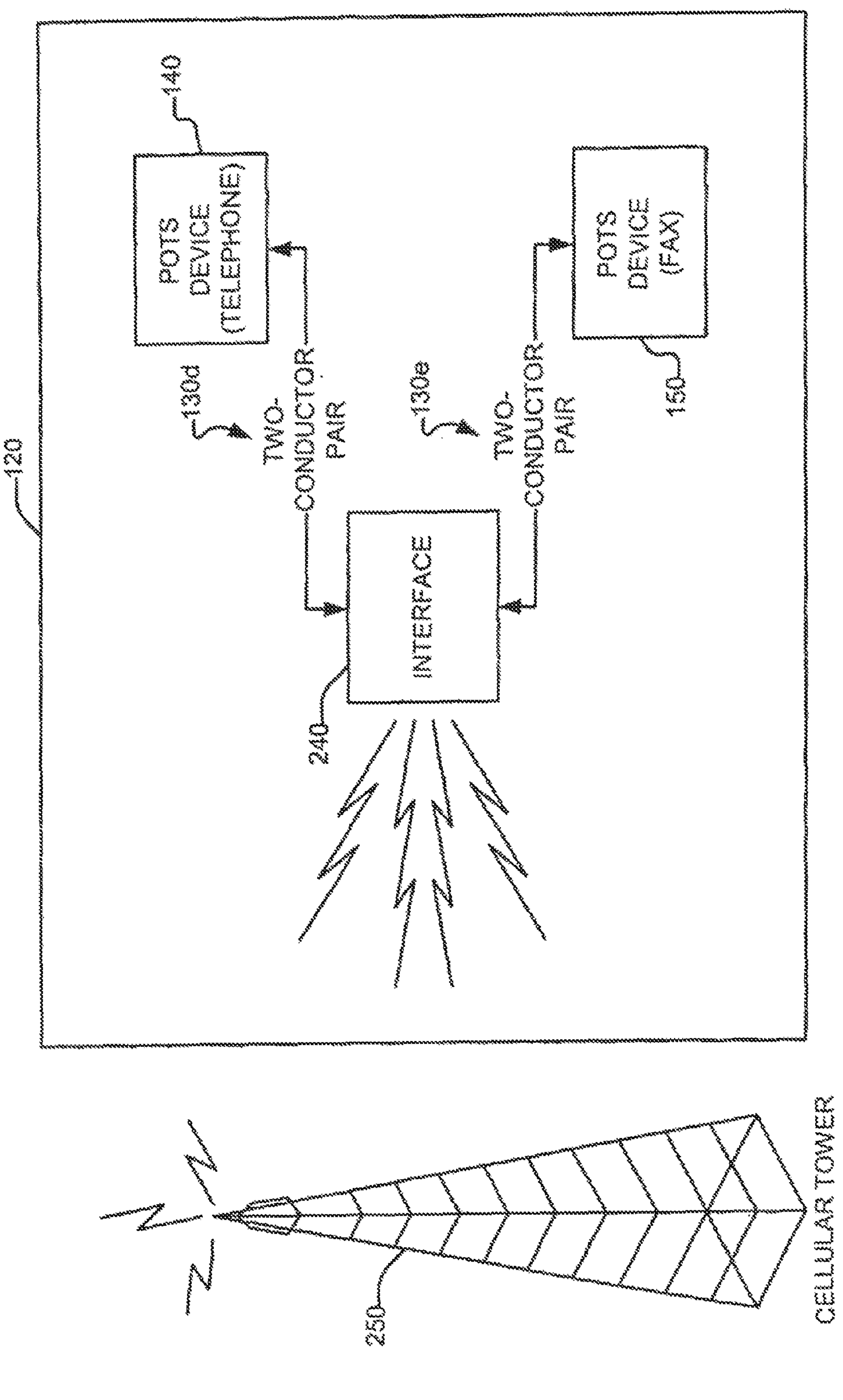

120
140
POTS DEVICE (TELEPHONE)
POTS DEVICE (FAX)
150
130d
TWO-CONDUCTOR PAIR
130e
TWO-CONDUCTOR PAIR
INTERFACE
240
250
CELLULAR TOWER

FIG. 2

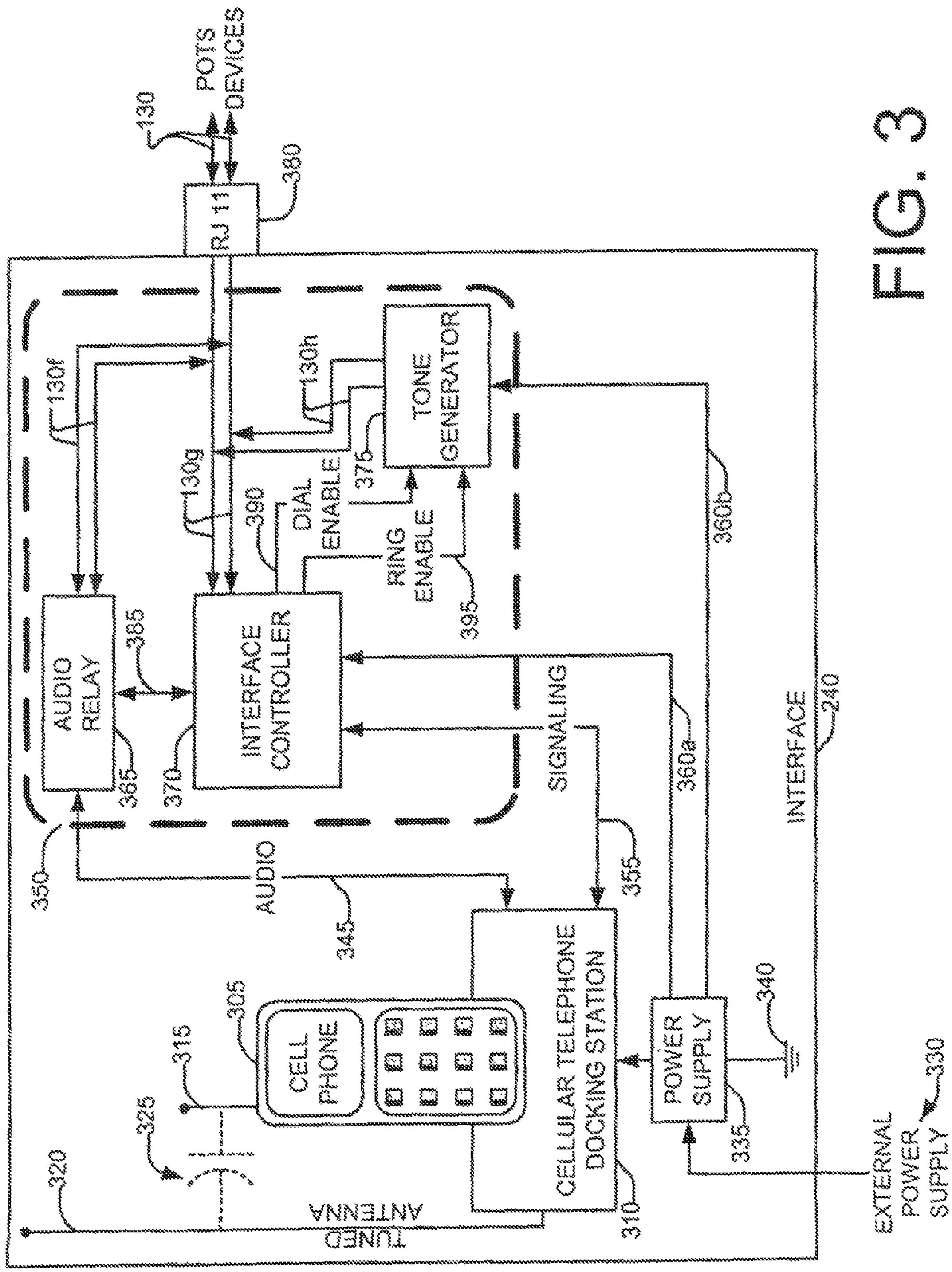

POTS
DEVICES
130
RJ 11
380
130f
130h
TONE
GENERATOR
375
130g
390
DIAL
ENABLE
RING
ENABLE
395
AUDIO
RELAY
385
INTERFACE
CONTROLLER
365
370
SIGNALING
360a
360b
INTERFACE
240
350
AUDIO
345
355
CELLULAR TELEPHONE
DOCKING STATION
310
CELL
PHONE
305
315
325
320
TUNED
ANTENNA
POWER
SUPPLY
335
340
EXTERNAL
POWER
SUPPLY
330

FIG. 3

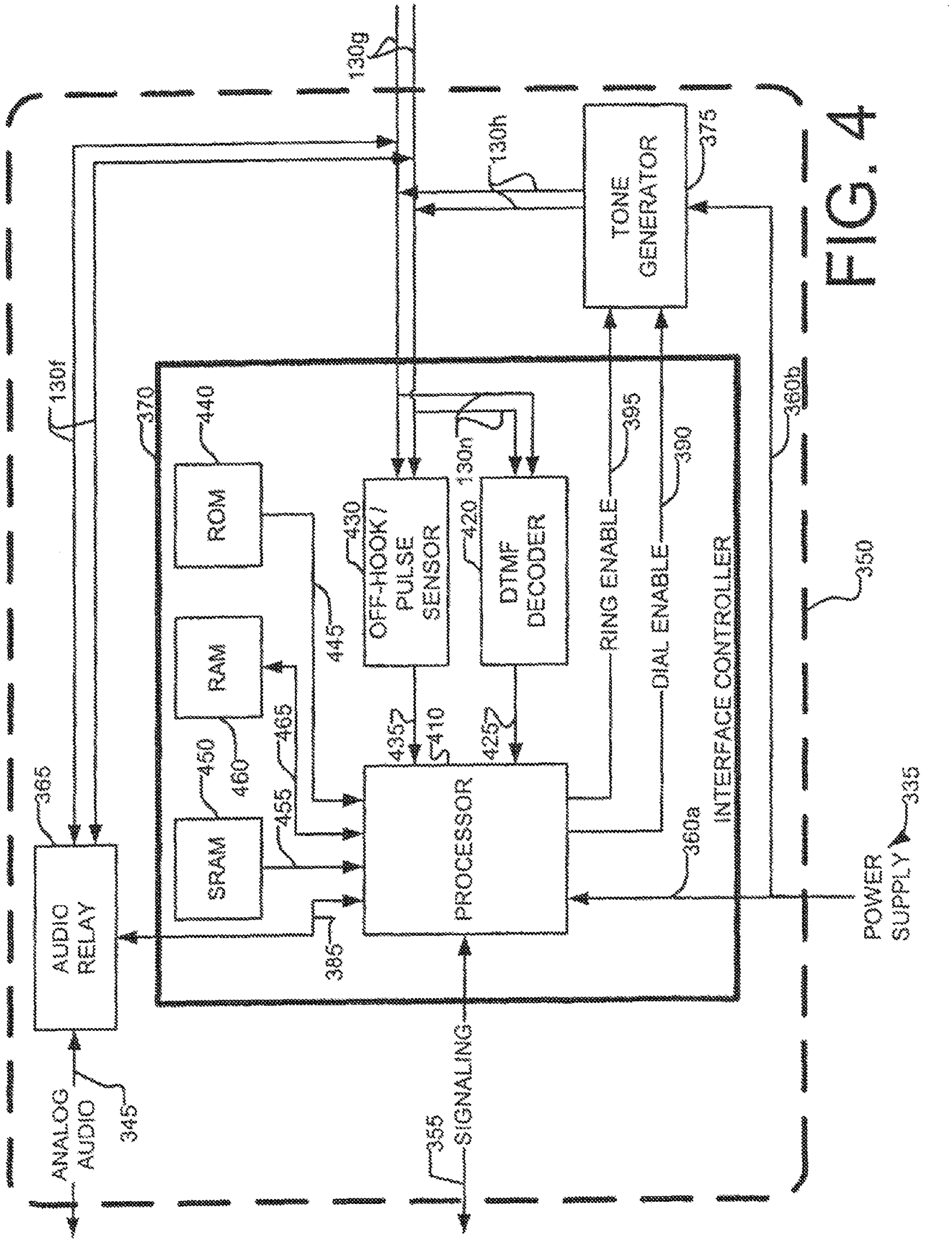

AUDIO RELAY
365
ANALOG AUDIO
345
130f
130g
130h
370
440
ROM
RAM
SRAM
450
460
455
465
445
430
OFF-HOOK / PULSE SENSOR
420
DTMF DECODER
130n
435
410
425
385
PROCESSOR
SIGNALING
355
POWER SUPPLY
335
360a
360b
RING ENABLE
395
DIAL ENABLE
390
INTERFACE CONTROLLER
TONE GENERATOR
375
350

FIG. 4

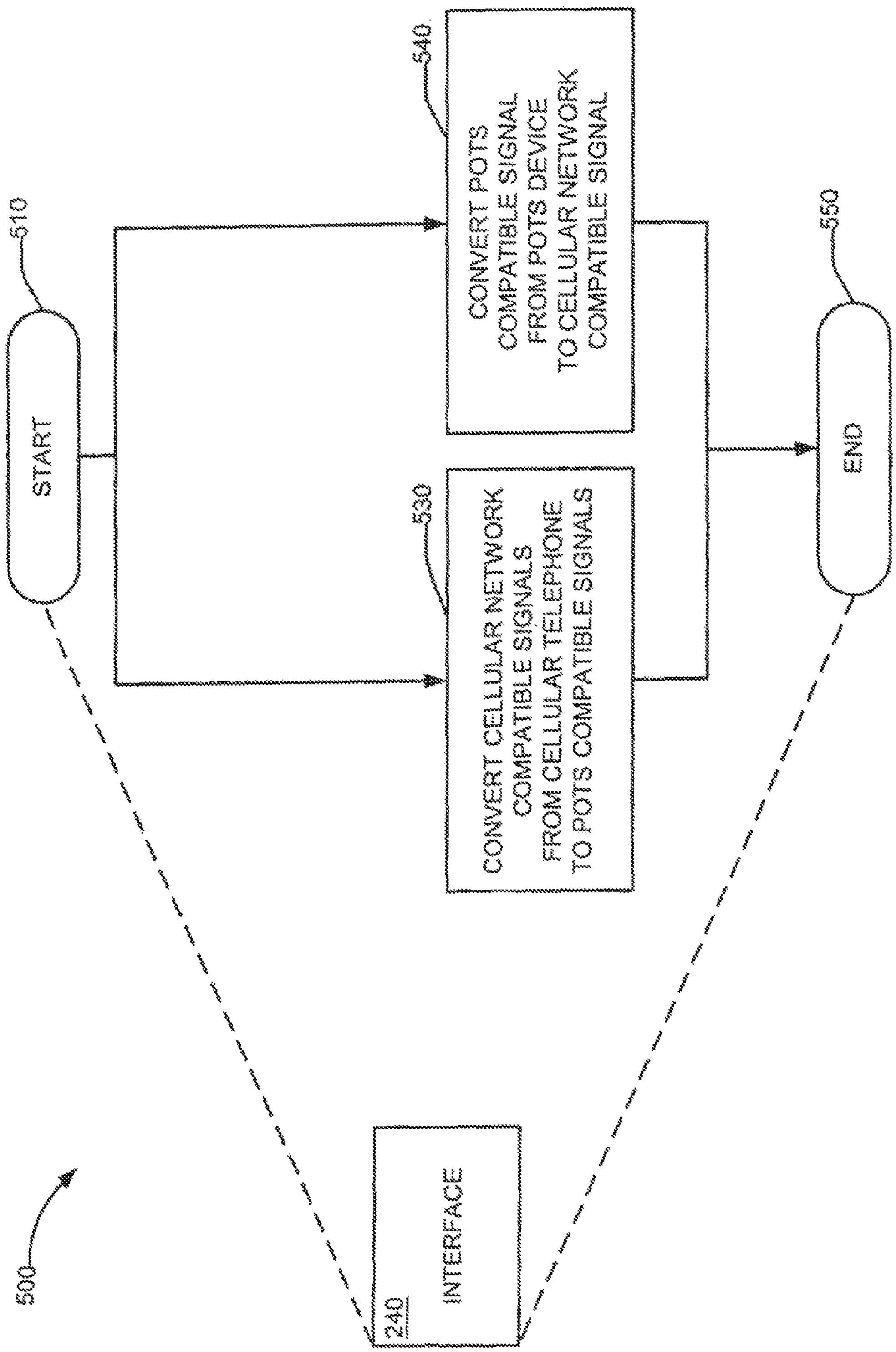

500
240
INTERFACE
START
510
530
CONVERT CELLULAR NETWORK COMPATIBLE SIGNALS FROM CELLULAR TELEPHONE TO POTS COMPATIBLE SIGNALS
540
CONVERT POTS COMPATIBLE SIGNAL FROM POTS DEVICE TO CELLULAR NETWORK COMPATIBLE SIGNAL
550
END

FIG. 5

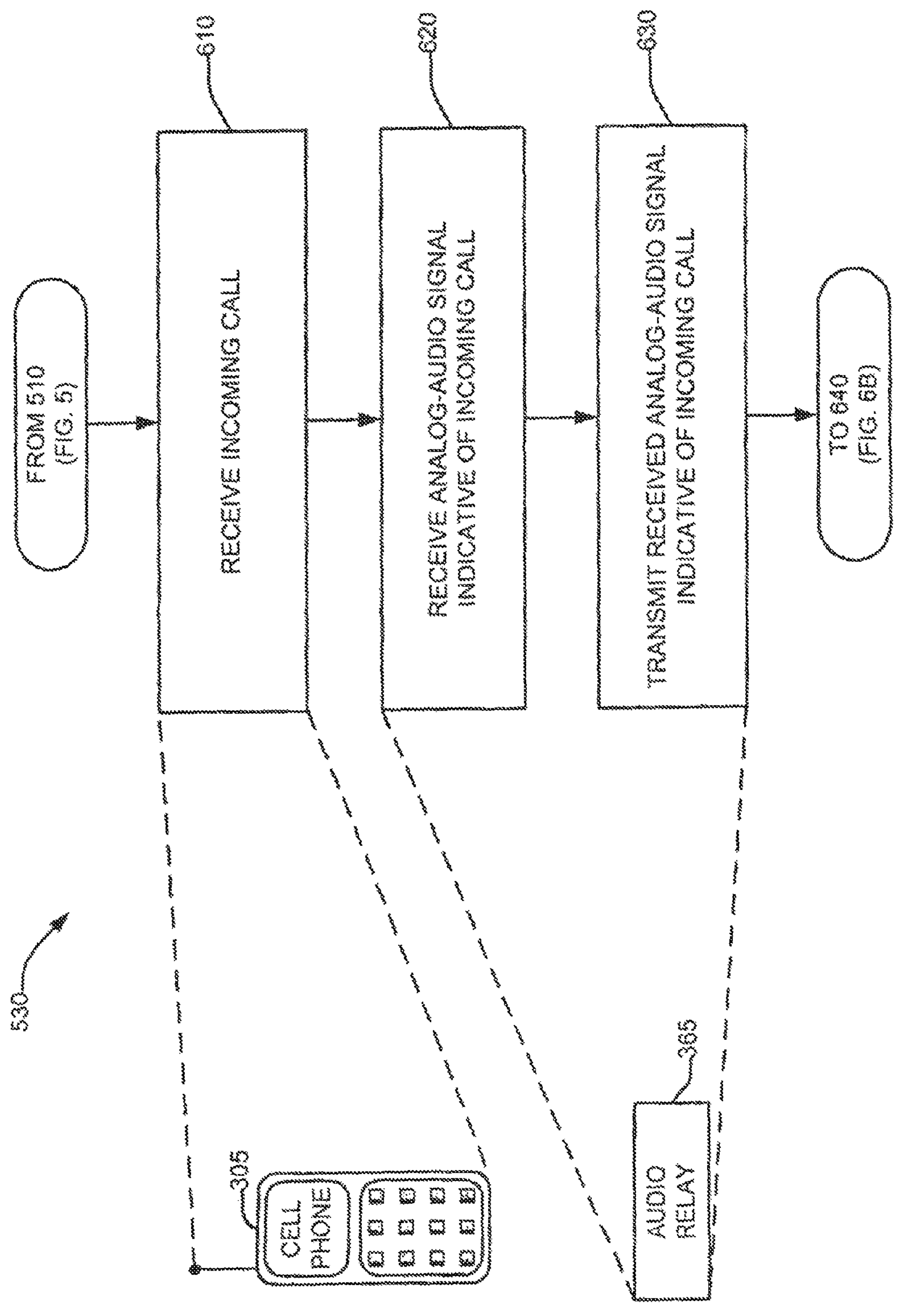

530
FROM 510
(FIG. 5)
RECEIVE INCOMING CALL
610
RECEIVE ANALOG-AUDIO SIGNAL
INDICATIVE OF INCOMING CALL
620
TRANSMIT RECEIVED ANALOG-AUDIO SIGNAL
INDICATIVE OF INCOMING CALL
630
TO 640
(FIG. 6B)
CELL
PHONE
305
AUDIO
RELAY
365

FIG. 6A

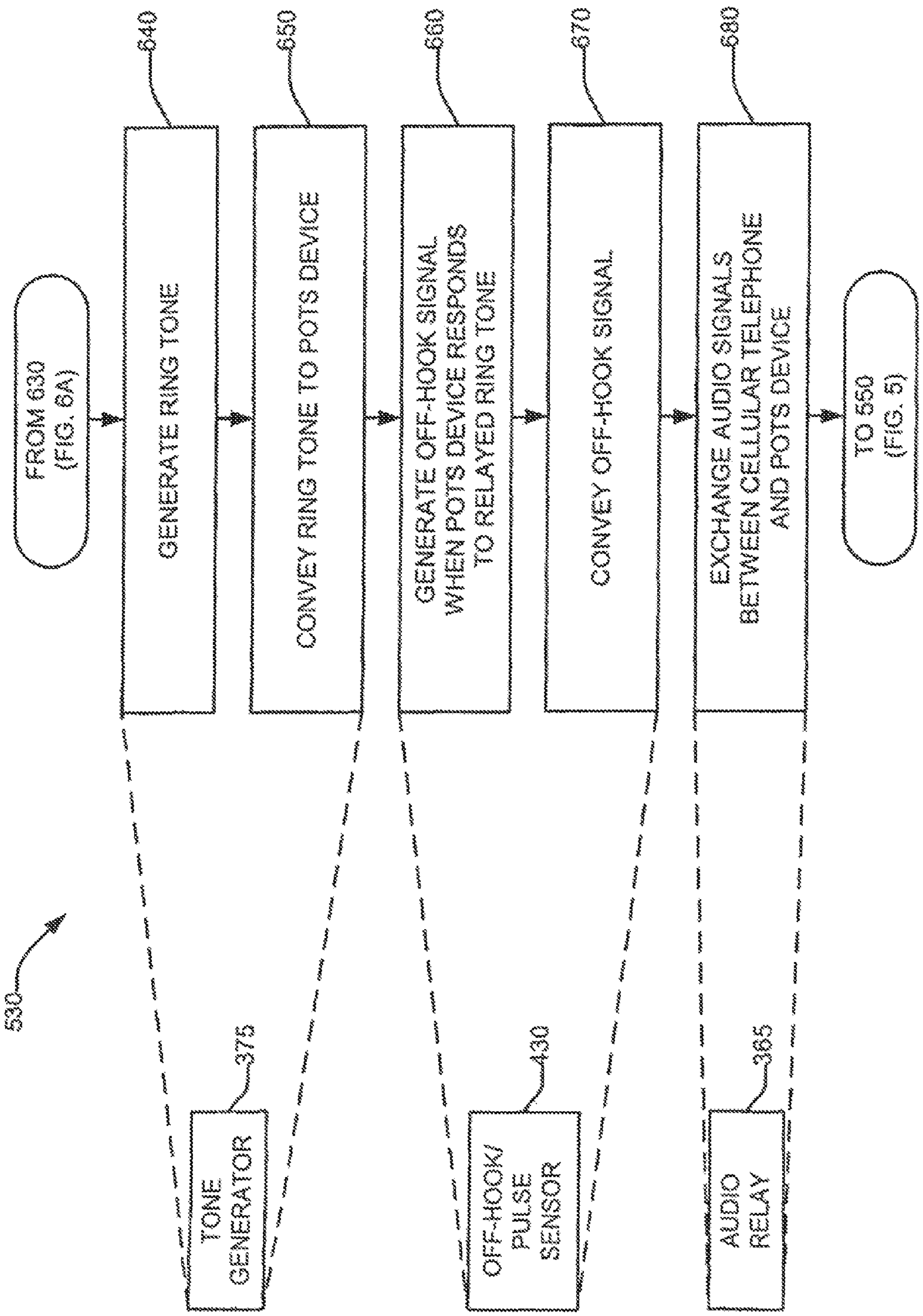

530
FROM 630 (FIG. 6A)
GENERATE RING TONE
640
CONVEY RING TONE TO POTS DEVICE
650
GENERATE OFF-HOOK SIGNAL WHEN POTS DEVICE RESPONDS TO RELAYED RING TONE
660
CONVEY OFF-HOOK SIGNAL
670
EXCHANGE AUDIO SIGNALS BETWEEN CELLULAR TELEPHONE AND POTS DEVICE
680
TO 550 (FIG. 5)
TONE GENERATOR
375
OFF-HOOK/ PULSE SENSOR
430
AUDIO RELAY
365

FIG. 6B

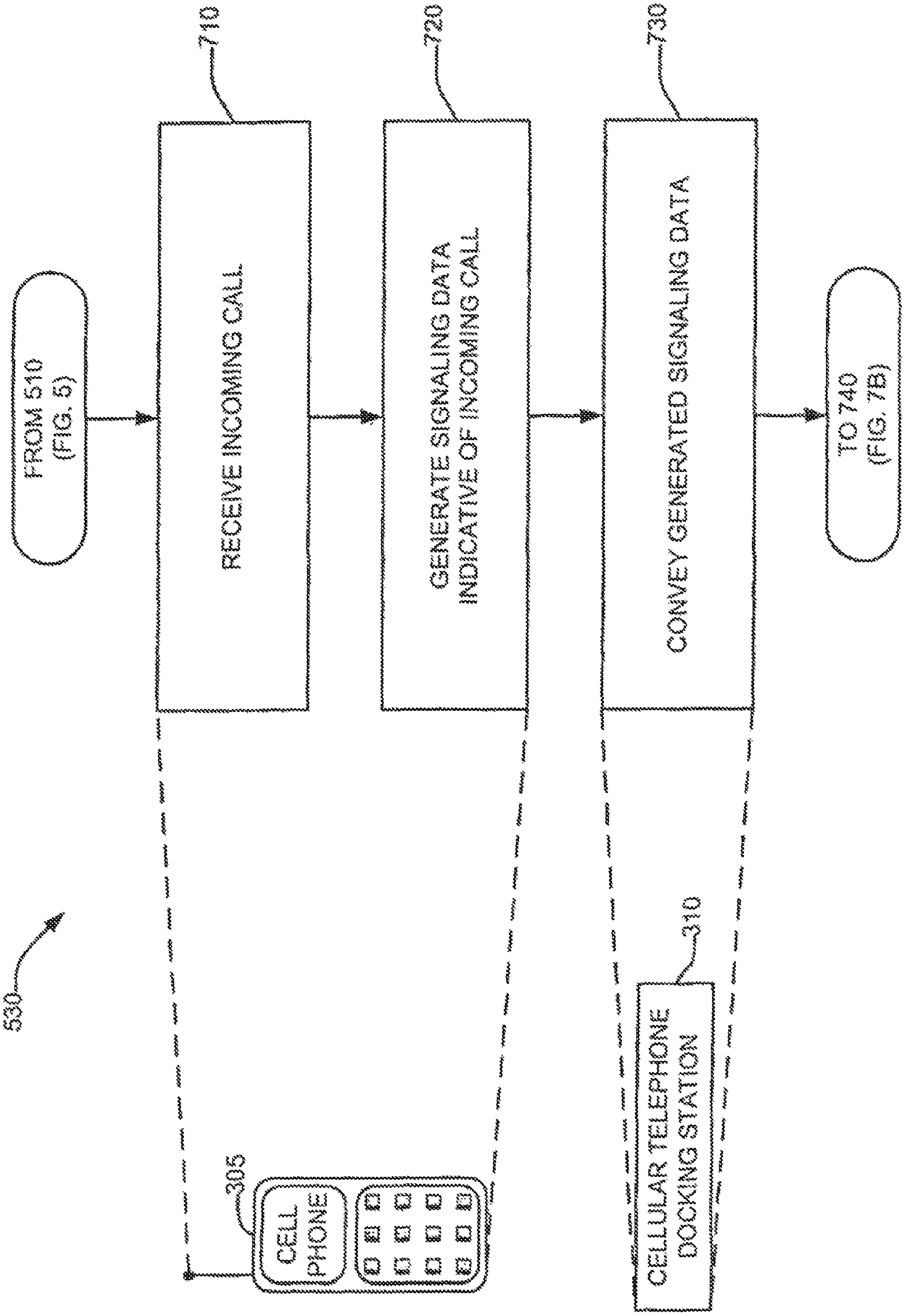

530
FROM 510 (FIG. 5)
710
RECEIVE INCOMING CALL
720
GENERATE SIGNALING DATA INDICATIVE OF INCOMING CALL
730
CONVEY GENERATED SIGNALING DATA
TO 740 (FIG. 7B)
305
CELL PHONE
310
CELLULAR TELEPHONE DOCKING STATION

FIG. 7A

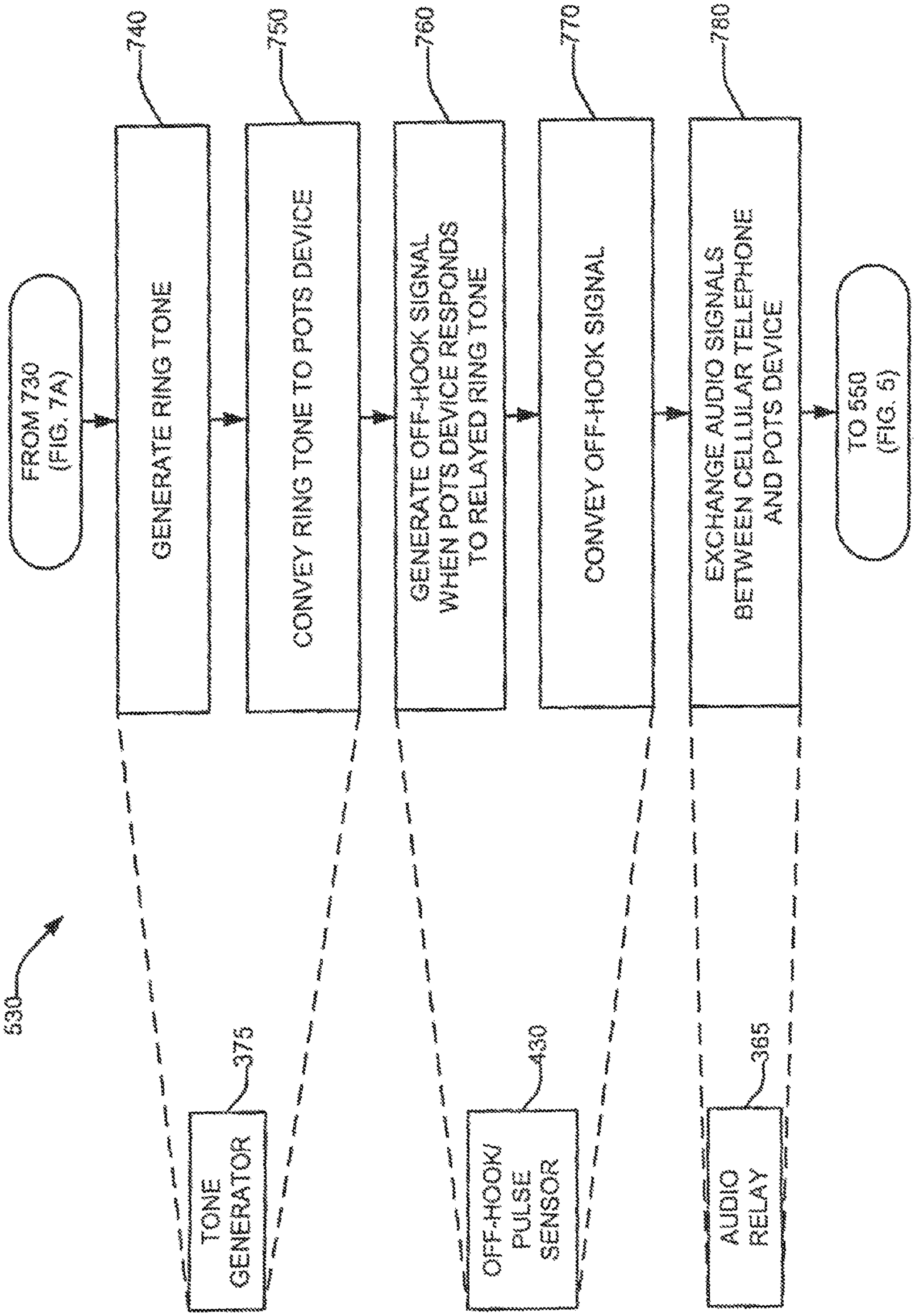

530
FROM 730
(FIG. 7A)
GENERATE RING TONE
740
CONVEY RING TONE TO POTS DEVICE
750
GENERATE OFF-HOOK SIGNAL
WHEN POTS DEVICE RESPONDS
TO RELAYED RING TONE
760
CONVEY OFF-HOOK SIGNAL
770
EXCHANGE AUDIO SIGNALS
BETWEEN CELLULAR TELEPHONE
AND POTS DEVICE
780
TO 550
(FIG. 5)
TONE
GENERATOR
375
OFF-HOOK/
PULSE
SENSOR
430
AUDIO
RELAY
365

FIG. 7B

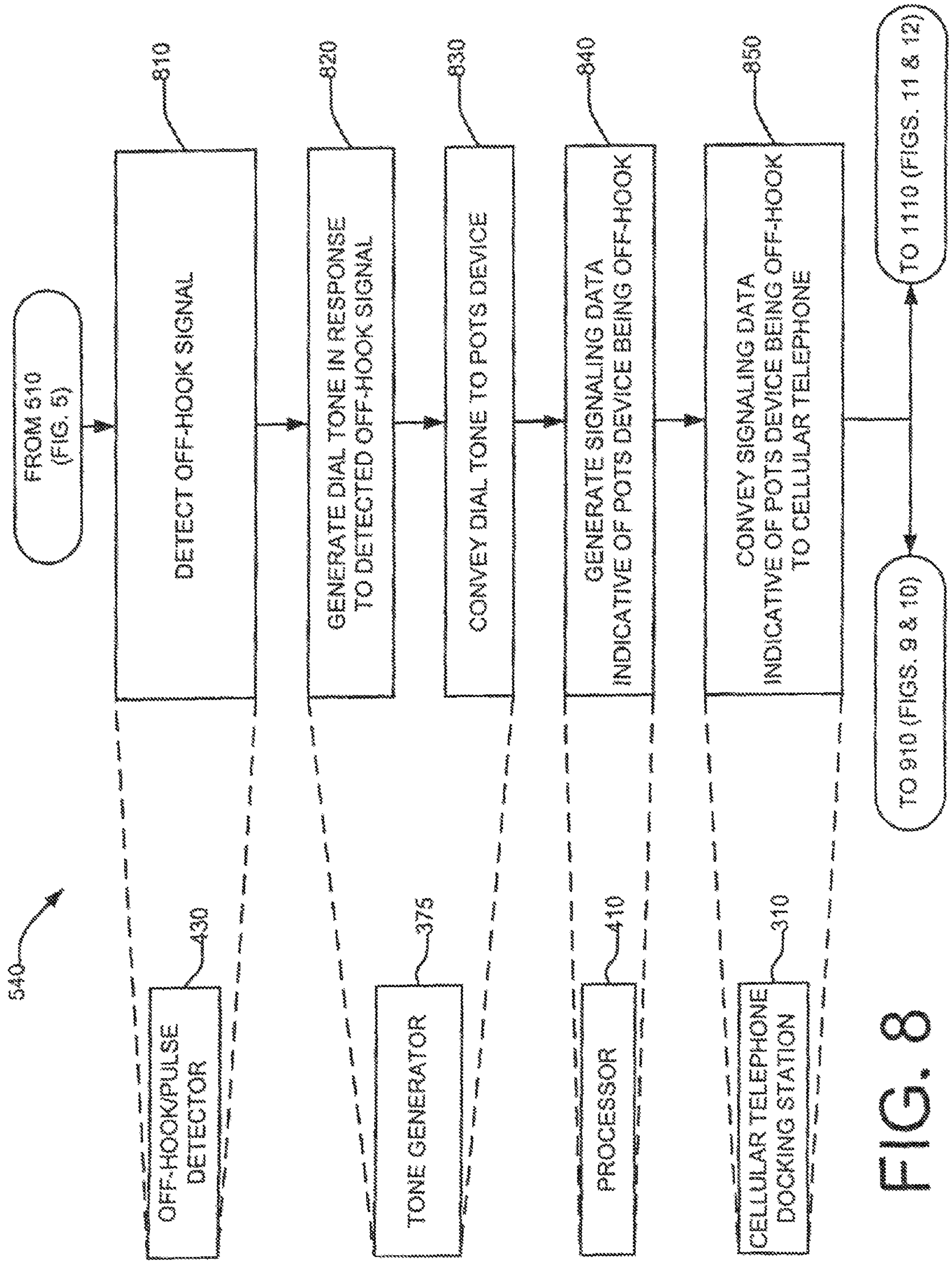

540
FROM 510 (FIG. 5)
DETECT OFF-HOOK SIGNAL
810
GENERATE DIAL TONE IN RESPONSE TO DETECTED OFF-HOOK SIGNAL
820
CONVEY DIAL TONE TO POTS DEVICE
830
GENERATE SIGNALING DATA INDICATIVE OF POTS DEVICE BEING OFF-HOOK
840
CONVEY SIGNALING DATA INDICATIVE OF POTS DEVICE BEING OFF-HOOK TO CELLULAR TELEPHONE
850
TO 910 (FIGS. 9 & 10)
TO 1110 (FIGS. 11 & 12)
OFF-HOOK/PULSE DETECTOR
430
TONE GENERATOR
375
PROCESSOR
410
CELLULAR TELEPHONE DOCKING STATION
310

FIG. 8

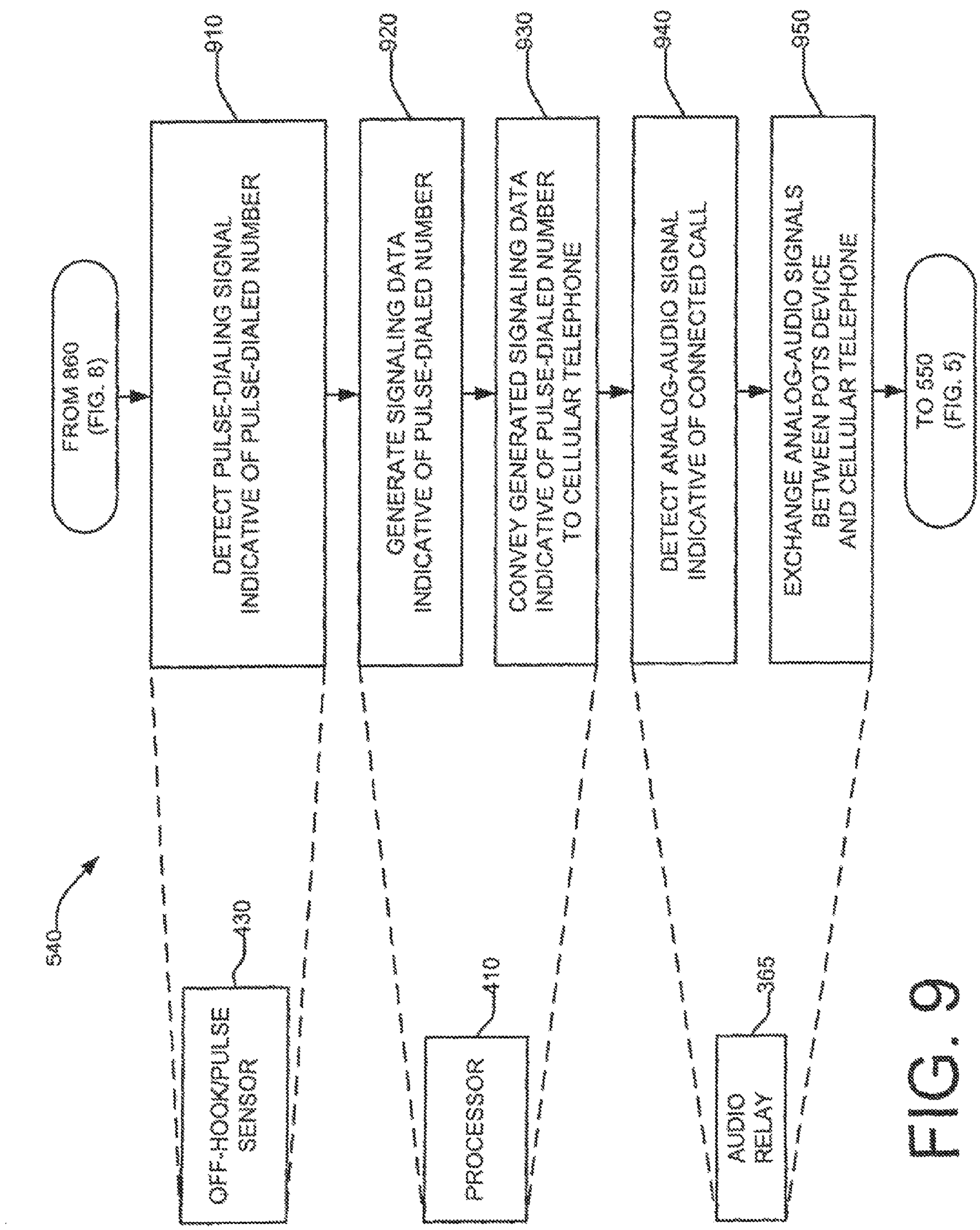

540
FROM 860 (FIG. 8)
DETECT PULSE-DIALING SIGNAL INDICATIVE OF PULSE-DIALED NUMBER
910
GENERATE SIGNALING DATA INDICATIVE OF PULSE-DIALED NUMBER
920
CONVEY GENERATED SIGNALING DATA INDICATIVE OF PULSE-DIALED NUMBER TO CELLULAR TELEPHONE
930
DETECT ANALOG-AUDIO SIGNAL INDICATIVE OF CONNECTED CALL
940
EXCHANGE ANALOG-AUDIO SIGNALS BETWEEN POTS DEVICE AND CELLULAR TELEPHONE
950
TO 550 (FIG. 5)
OFF-HOOK/PULSE SENSOR
430
PROCESSOR
410
AUDIO RELAY
365

FIG. 9

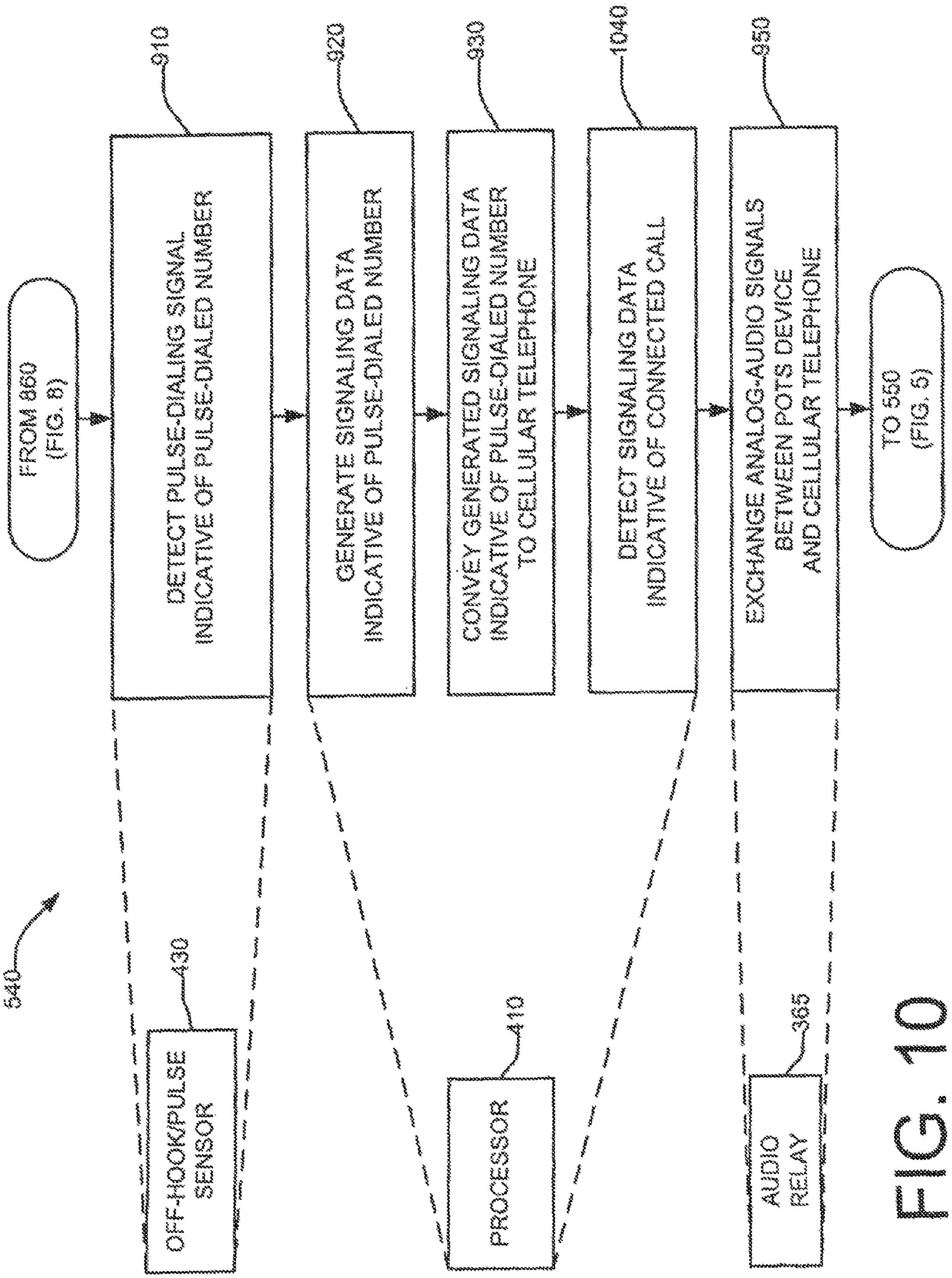

540
FROM 860 (FIG. 8)
DETECT PULSE-DIALING SIGNAL INDICATIVE OF PULSE-DIALED NUMBER
910
GENERATE SIGNALING DATA INDICATIVE OF PULSE-DIALED NUMBER
920
CONVEY GENERATED SIGNALING DATA INDICATIVE OF PULSE-DIALED NUMBER TO CELLULAR TELEPHONE
930
DETECT SIGNALING DATA INDICATIVE OF CONNECTED CALL
1040
EXCHANGE ANALOG-AUDIO SIGNALS BETWEEN POTS DEVICE AND CELLULAR TELEPHONE
950
TO 550 (FIG. 5)
OFF-HOOK/PULSE SENSOR
430
PROCESSOR
410
AUDIO RELAY
365

FIG. 10

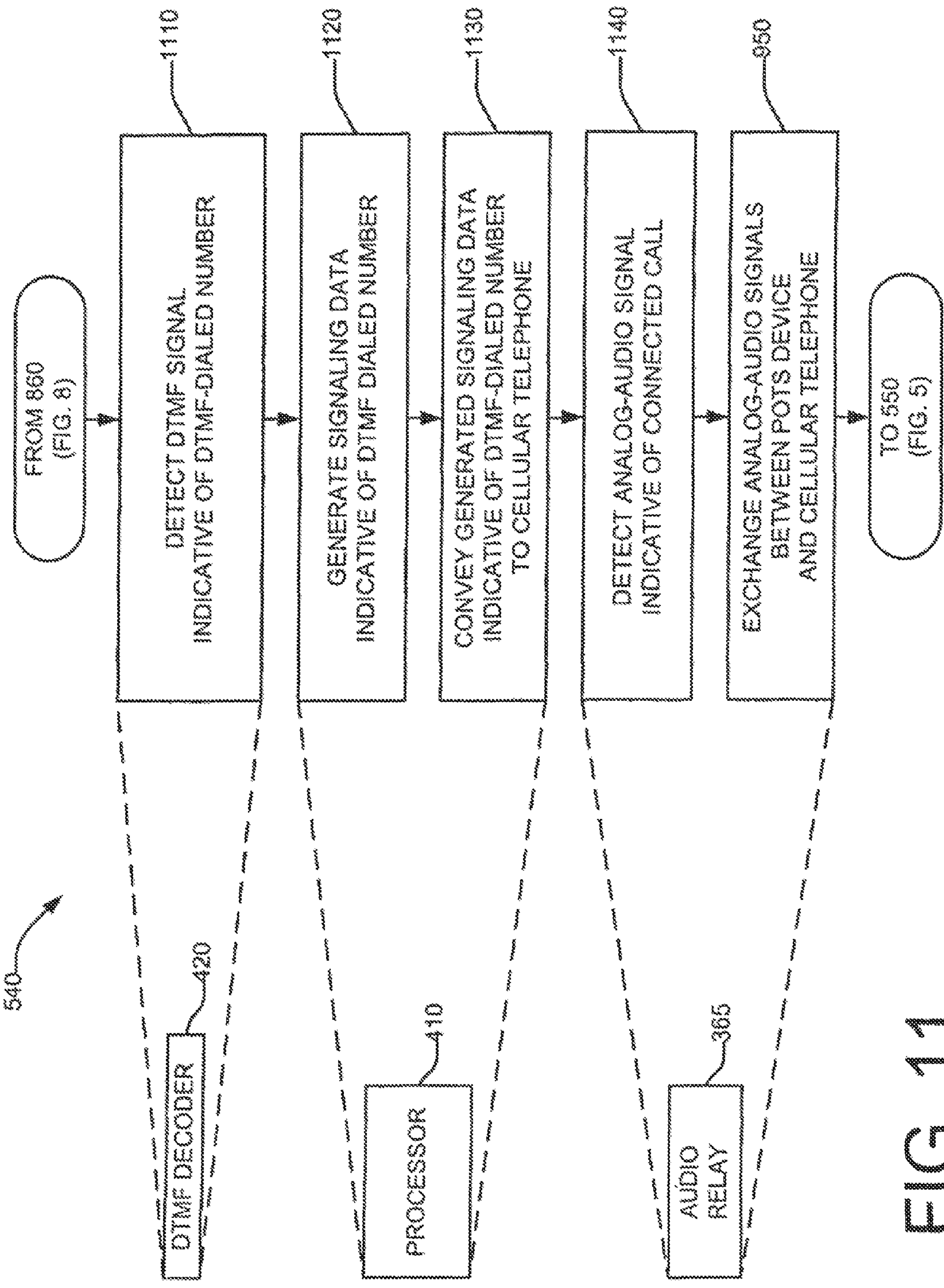

540
FROM 850 (FIG. 8)
DETECT DTMF SIGNAL INDICATIVE OF DTMF-DIALED NUMBER
1110
GENERATE SIGNALING DATA INDICATIVE OF DTMF DIALED NUMBER
1120
CONVEY GENERATED SIGNALING DATA INDICATIVE OF DTMF-DIALED NUMBER TO CELLULAR TELEPHONE
1130
DETECT ANALOG-AUDIO SIGNAL INDICATIVE OF CONNECTED CALL
1140
EXCHANGE ANALOG-AUDIO SIGNALS BETWEEN POTS DEVICE AND CELLULAR TELEPHONE
950
TO 550 (FIG. 5)
DTMF DECODER
420
PROCESSOR
410
AUDIO RELAY
365

FIG. 11

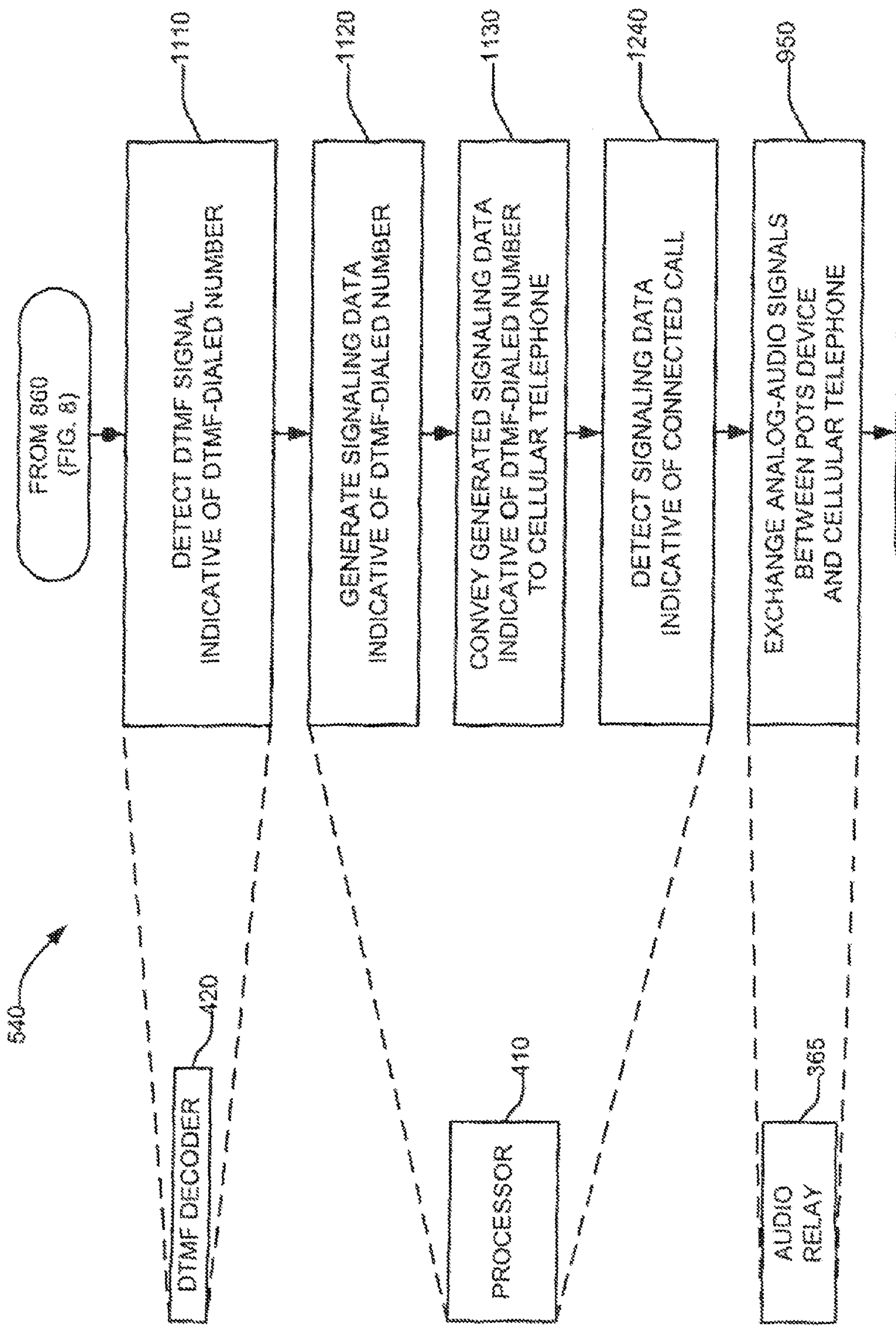

540
FROM 860 (FIG. 8)
DETECT DTMF SIGNAL INDICATIVE OF DTMF-DIALED NUMBER
1110
GENERATE SIGNALING DATA INDICATIVE OF DTMF-DIALED NUMBER
1120
CONVEY GENERATED SIGNALING DATA INDICATIVE OF DTMF-DIALED NUMBER TO CELLULAR TELEPHONE
1130
DETECT SIGNALING DATA INDICATIVE OF CONNECTED CALL
1240
EXCHANGE ANALOG-AUDIO SIGNALS BETWEEN POTS DEVICE AND CELLULAR TELEPHONE
950
TO 550 (FIG. 5)
DTMF DECODER
420
PROCESSOR
410
AUDIO RELAY
365

FIG. 12

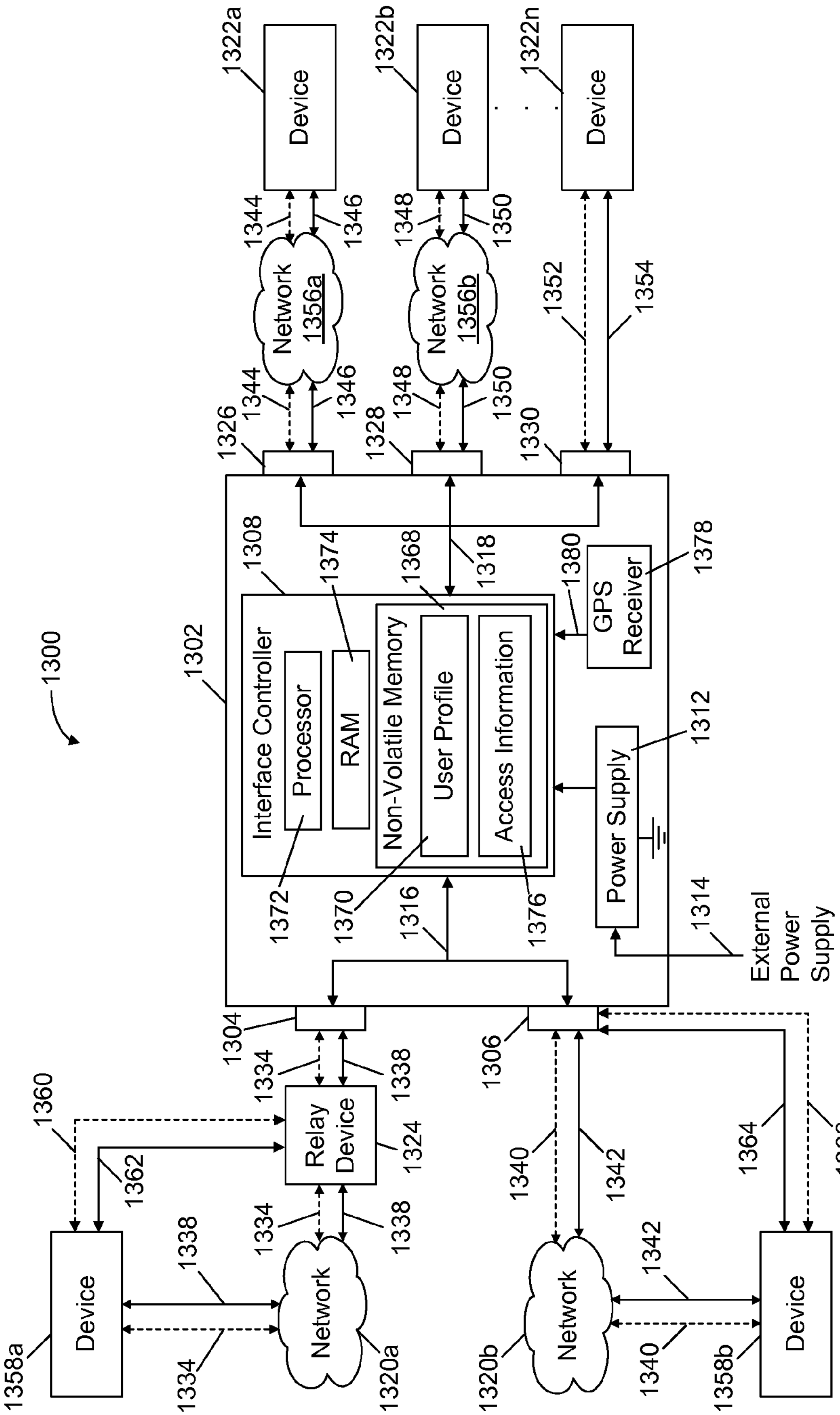

1300
1302
Interface Controller
1308
Processor
1372
RAM
1374
Non-Volatile Memory
1368
User Profile
1370
Access Information
1376
GPS Receiver
1378
1380
Power Supply
1312
External Power Supply
1314
1316
1318
1304
1306
1326
1328
1330
Relay Device
1324
Device
1358a
Device
1358b
Network
1320a
Network
1320b
Network 1356a
Network 1356b
Device
1322a
Device
1322b
Device
1322n
1334
1338
1340
1342
1344
1346
1348
1350
1352
1354
1360
1362
1364
1366

FIG. 13

FIG. 14

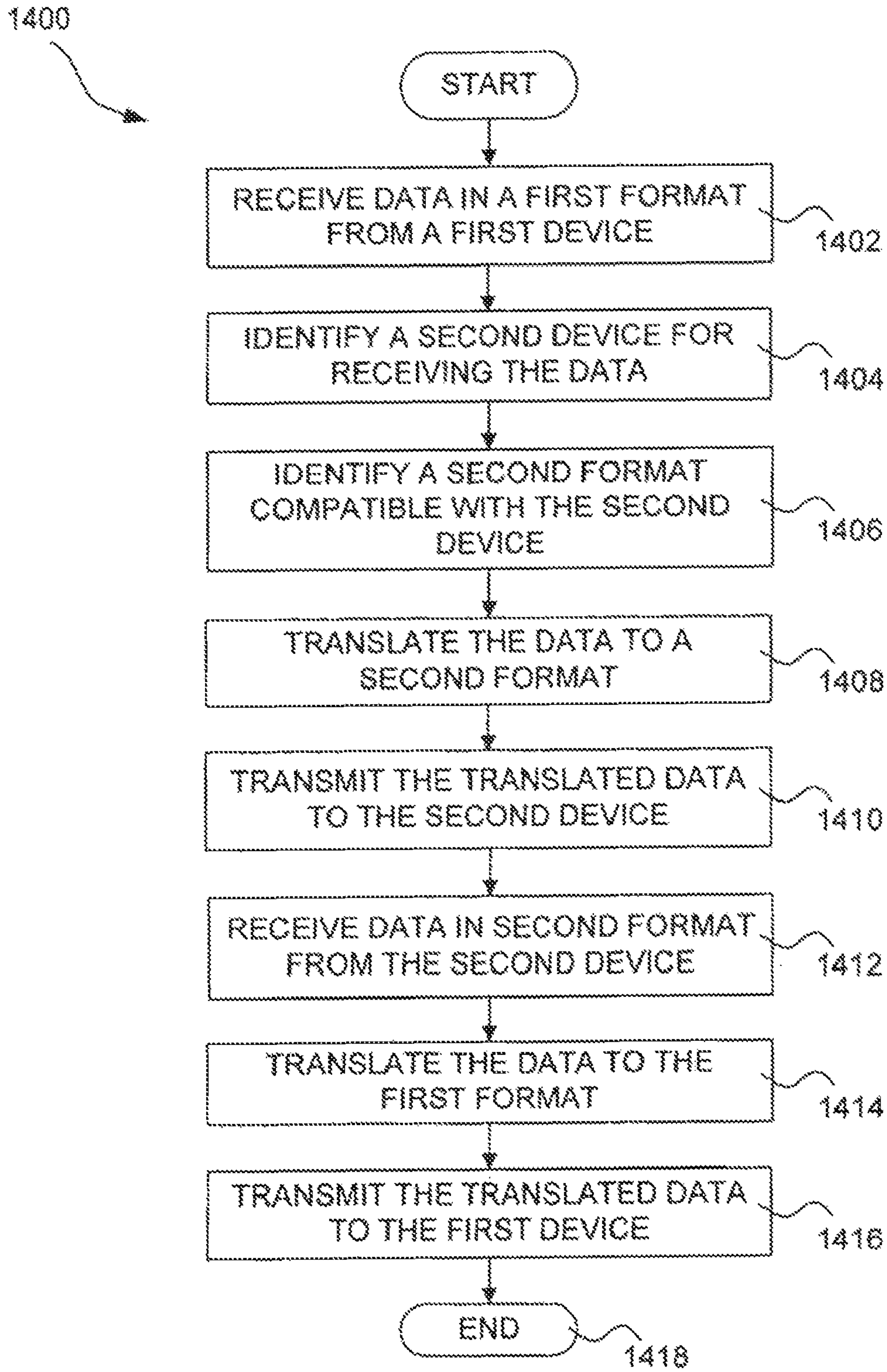
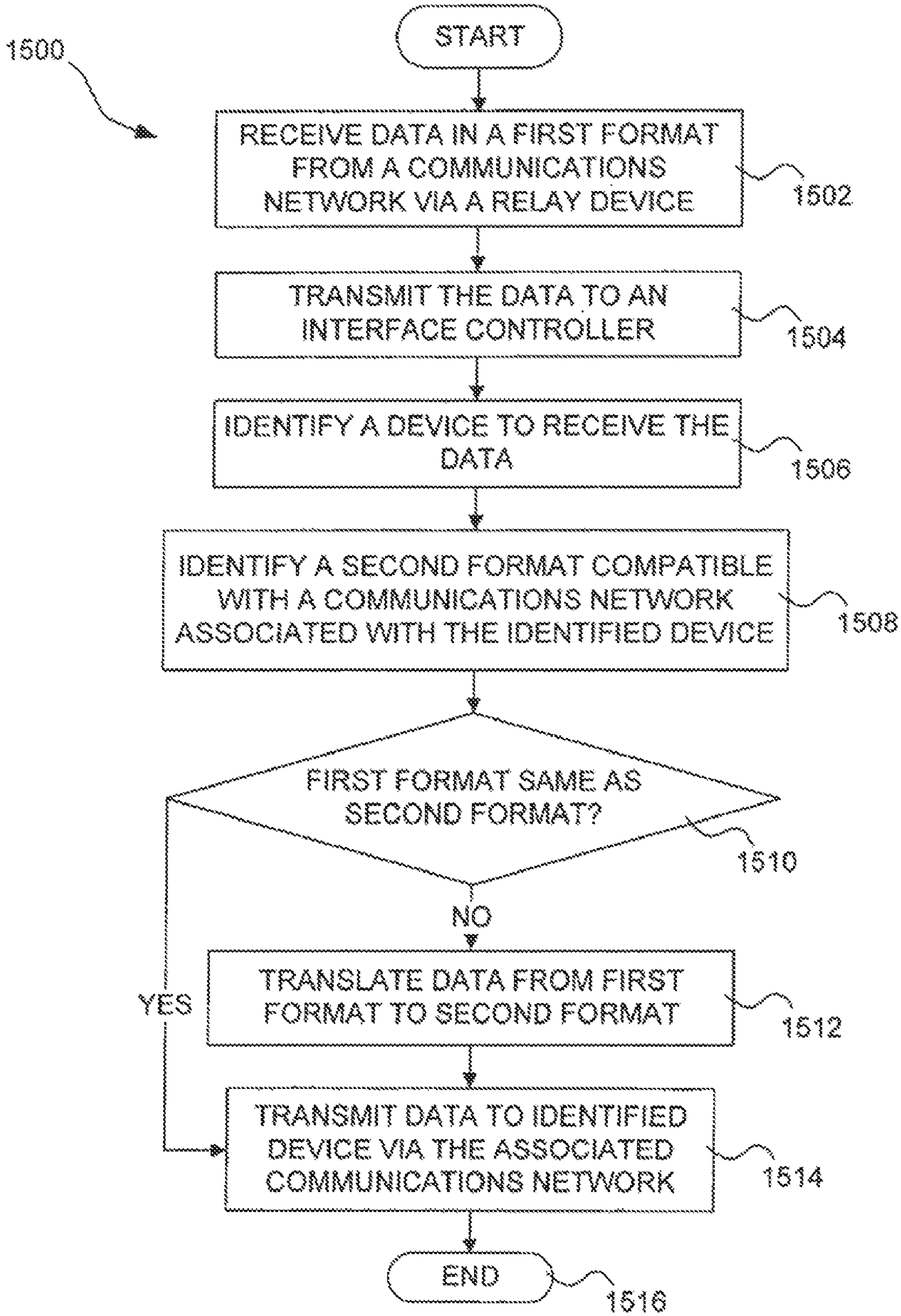

1400
START
RECEIVE DATA IN A FIRST FORMAT FROM A FIRST DEVICE
1402
IDENTIFY A SECOND DEVICE FOR RECEIVING THE DATA
1404
IDENTIFY A SECOND FORMAT COMPATIBLE WITH THE SECOND DEVICE
1406
TRANSLATE THE DATA TO A SECOND FORMAT
1408
TRANSMIT THE TRANSLATED DATA TO THE SECOND DEVICE
1410
RECEIVE DATA IN SECOND FORMAT FROM THE SECOND DEVICE
1412
TRANSLATE THE DATA TO THE FIRST FORMAT
1414
TRANSMIT THE TRANSLATED DATA TO THE FIRST DEVICE
1416
END
1418

FIG. 15


1500
START
RECEIVE DATA IN A FIRST FORMAT FROM A COMMUNICATIONS NETWORK VIA A RELAY DEVICE
1502
TRANSMIT THE DATA TO AN INTERFACE CONTROLLER
1504
IDENTIFY A DEVICE TO RECEIVE THE DATA
1506
IDENTIFY A SECOND FORMAT COMPATIBLE WITH A COMMUNICATIONS NETWORK ASSOCIATED WITH THE IDENTIFIED DEVICE
1508
FIRST FORMAT SAME AS SECOND FORMAT?
1510
NO
YES
TRANSLATE DATA FROM FIRST FORMAT TO SECOND FORMAT
1512
TRANSMIT DATA TO IDENTIFIED DEVICE VIA THE ASSOCIATED COMMUNICATIONS NETWORK
1514
END
1516

# APPARATUS, METHOD, AND COMPUTER-READABLE MEDIUM FOR INTERFACING DEVICES WITH COMMUNICATIONS NETWORKS

## CROSS REFERENCE TO RELATED APPLICATIONS

This patent application is a Continuation of U.S. patent application Ser. No. 11/323,820, entitled "Apparatus, Method, and Computer-Readable Medium for Interfacing Devices with Communications Networks," filed Dec. 30, 2005 now abandoned, which is a Continuation-In-Part patent application Ser. No. 10/195,197 of U.S. Pat. No. 7,194,083, entitled "System and Method for Interfacing Plain Old Telephone System (POTS) Devices with Cellular Networks," filed on Jul. 15, 2002, each of which is herein incorporated by reference in its entirety.

This patent application is related to the following U.S. patents and co-pending U.S. patent applications: U.S. Pat. No. 7,623,654, entitled "Systems and Methods for Interfacing Telephony Devices with Cellular and Computer Networks," filed on Aug. 30, 2004; U.S. Pat. No. 7,522,722, entitled "System and Method for Interfacing Plain Old Telephone System (POTS) Devices with Cellular Devices in Communication with a Cellular Network," filed on Aug. 30, 2004; U.S. Pat. No. 7,200,424, entitled "Systems and Methods for Restricting the Use and Movement of Telephony Devices," filed on Aug. 30, 2004; U.S. Pat. No. 7,623,653, entitled "Systems and Methods for Passing Through Alternative Network Device Features to Plain Old Telephone System (POTS) Devices," filed on Aug. 30, 2004; U.S. Pat. No. 7,363,034, entitled "Cellular Docking Station," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/323,180, entitled "Apparatus, Method, and Computer-Readable Medium for Interfacing Communications Devices," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/323,825, entitled "Apparatus and Method for Providing a User Interface for Facilitating Communications Between Devices," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/323,181, entitled "Apparatus, Method, and Computer-Readable Medium for Securely Providing Communications Between Devices and Networks," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/324,034, entitled "Plurality of Interface Devices for Facilitating Communications Between Devices and Communications Networks," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/323,182, entitled "Apparatus and Method for Providing Communications and Connection-Oriented Services to Devices," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/323,185, entitled "Apparatus and Method for Prioritizing Communications Between Devices," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/324,149, entitled "Apparatus, Method, and Computer-Readable Medium for Communication Between and Controlling Network Devices," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/323,186, entitled "Apparatus and Method for Aggregating and Accessing Data According to User Information," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/324,033, entitled "Apparatus and Method for Restricting Access to Data," filed on Dec. 30, 2005; U.S. patent application Ser. No. 11/323,818, entitled "Apparatus and Method for Providing Emergency and Alarm Communications," filed on Dec. 30, 2005; and U.S. patent application Ser. No. 11/324,154, entitled "Apparatus and Method for Testing Communication Capabilities of Networks and Devices," filed on Dec. 30, 2005. Each of the U.S.



patents and applications listed in this section is herein incorporated by reference in its entirety.

## TECHNICAL FIELD

The exemplary embodiments relate generally to telecommunications and, more particularly, to an apparatus, method, and computer-readable medium for interfacing devices with communications networks.

## BACKGROUND

Emerging communications network protocols and solutions, such as Voice over Internet Protocol (VoIP) and WI-FI, allow individuals to use VoIP and WI-FI compatible devices to communicate with each other over wide area networks, such as the Internet, in the same manner in which they currently communicate over the Public Switched Telecommunications Network (PSTN). However, in most instances, owners of legacy devices such as cellular telephones and Plain Old Telephone System (POTS) devices which are compatible with cellular networks and the PSTN are not capable of interfacing these devices to networks associated with the emerging communications network protocol and solutions. Thus, legacy device owners are inconvenienced by having multiple devices that lack functionality with the emerging communications network protocols and solutions. Owners of legacy devices cannot convert data sent via the emerging communications network protocols and solutions to formats compatible with the legacy devices. Moreover, users cannot dictate which devices should receive data and in what format the devices should receive the data.

## SUMMARY

In accordance with the present exemplary embodiments, the above and other problems are solved by providing an apparatus, method, and computer-readable medium for providing communications between a first communications network and a device associated with a second communications network. Through the embodiments, communications between a first communications network and a device associated with a second communications network can be provided by an interface device.

According to one aspect, an interface device for providing communications between a first communications network and a device associated with a second communications network comprises one or more inputs, one or more outputs, and logic. The one or more inputs of the interface device receive data in a first format from the first communications network. The logic translates the data to a second format compatible with the second communications device. The translated data is then transmitted to the device associated with the second communications network via the one or more outputs. The first and second formats may comprise rich media content.

The data is received at the one or more inputs from the first communications network, which may be a wireless or a wired network, via a communications device. The data may be received at the one or more inputs from the communications device via a wireless connection or a wired connection.

According to other aspects, a method for providing communications between a first communications network and a device associated with a second communications network via an interface device is provided. Data in a first format is received from the first communications network at one or more inputs of the interface device. In particular, the interface device receives the data from the first communications network via a communications device. The data received from the first communications device is translated to a second format compatible with the second communications device. In an embodiment, the translated data is transmitted to the device associated with the second communications network via one or more outputs of the interface device. The first communications network may be a wired or a wireless network. The data may be received at the one or more inputs from the communications device via a wireless connection or a wired connection.

According to yet another aspect, a computer-readable medium is provided having instructions stored thereon which, when executed by a computer, causes the computer to receive data in a first format from a first communications network at one or more inputs of an interface device. The data is received at the interface device from the first communications network via a communications device. The data is translated to a second format compatible with a second communications network and is then transmitted to a device associated with the second communications network via one or more outputs. The first communications network may be a wired network. The data may be received at the one or more inputs from the communications device via a wireless connection or a wired connection.

The above-described aspects may also be implemented as a computer-controlled apparatus, a computer process, a computing system, an apparatus, or as an article of manufacture such as a computer program product or computer-readable medium. The computer program product may be a computer storage media readable by a computer system and encoding a computer program of instructions for executing a computer process. The computer program product may also be a propagated signal on a carrier readable by a computing system and encoding a computer program of instructions for executing a computer process.

These and various other features as well as advantages, which characterize exemplary embodiments, will be apparent from a reading of the following detailed description and a review of the associated drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the exemplary embodiments can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the exemplary embodiments. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is a block diagram showing a conventional POTS connection to a telephone company through a network interface device;

FIG. **2** is a block diagram showing one illustrative embodiment of the system for interfacing POTS devices with cellular networks;

FIG. **3** is a block diagram showing one illustrative embodiment of the interface of FIG. **2**;

FIG. **4** is a block diagram showing one illustrative embodiment of the hardware within the interface of FIG. **3**;

FIG. **5** is a flowchart showing one illustrative embodiment of the method for interfacing POTS devices with cellular networks;

FIGS. **6**A and **6**B are flowcharts showing one illustrative embodiment of the method associated with the conversion of cellular network compatible signals to POTS compatible signals;

FIGS. **7**A and **7**B are flowcharts showing another illustrative embodiment of the method associated with the conversion of cellular network compatible signals to POTS compatible signals;

FIG. **8** is a flowchart showing several steps associated with the conversion of POTS compatible signals to cellular network compatible signals;

FIGS. **9** through **12** are flowcharts showing several illustrative embodiments of the method associated with the conversion of POTS compatible signals to cellular network compatible signals;

FIG. **13** is a block diagram showing an alternative illustrative embodiment of the interface device;

FIG. **14** is a flowchart showing an illustrative embodiment of the method and computer-readable medium associated with providing bi-directional communications between a first device and a second device; and

FIG. **15** is a flowchart showing an illustrative embodiment of the method and computer-readable medium associated with interfacing devices with communications networks.

## DETAILED DESCRIPTION

Reference will now be made in detail to the description. While several illustrative embodiments will be described in connection with these drawings, there is no intent to limit it to the illustrative embodiment or illustrative embodiments disclosed therein. On the contrary, the intent is to cover all alternatives, modifications, and equivalents included within the spirit and scope of the embodiments as defined by the claims.

FIG. **1** is a block diagram showing a conventional POTS connection to a PSTN **110** through a Network Interface Device (NID) **140**. Since such connections are well known, only a cursory discussion is presented here. As shown in FIG. **1**, several POTS devices **140**, **150** occupy a location **120** (e.g., home, business, etc.). Each POTS device **140**, **150** is connected to the NID **140** by two-conductor pair wires **130***b*, **130***c*, also known as POTS pairs, or twisted pairs. The NID **140** serves as the interface between the POTS devices **140**, **150** and the PSTN **110**, wherein the NID **140** is connected to the PSTN **110** through at least a two-conductor pair **130***a* or landline **130***a*. As evident from FIG. **1**, if the landline **130***a* is severed, or if the landline **130***a* is unavailable due to geographical limitations, then the POTS devices **140**, **150** within the location **120** have no connection to the PSTN **110**.

FIG. **2** is a block diagram showing one illustrative embodiment of a system for interfacing POTS devices **140**, **150** with cellular networks. As shown in FIG. **2**, one or more POTS devices **140**, **150** occupy a location **120**. However, unlike FIG. **1**, the POTS devices **140**, **150** in FIG. **2** are configured to communicate with at least one cellular tower **250** through an interface device **240**, thereby permitting connection between the POTS devices **140**, **150** and a cellular network. In this sense, the POTS devices **140**, **150** are connected to the interface device **240**, rather than an NID **140** (FIG. **1**), by two-conductor pair wires **130***d*, **130***e*. Since the interface device **240** is a bridge between the POTS devices **140**, **150** and the cellular network, the interface device **240** is configured to receive POTS compatible signals from the POTS devices **140**, **150** and convert the POTS compatible signals to cellular network compatible signals, which are transmitted from the interface device **240** to the cellular tower **250**. Additionally, the interface device **240** is configured to receive cellular network compatible signals from the cellular tower **250** and convert the cellular network compatible signals to POTS compatible signals, which are then forwarded to the POTS devices **140**, **150** for use within the location **120**. While a specific PSTN network is not shown in FIG. **2**, it will be clear to one of ordinary skill in the art that the cellular tower **250** may be connected to a PSTN network, thereby permitting communication with other PSTN devices.

FIG. **3** is a block diagram showing, in greater detail, a preferred illustrative embodiment of the interface device **240** of FIG. **2**. In the preferred illustrative embodiment, the cellular network compatible signals are transmitted and received at the interface device **240** by a cellular telephone **305** while the POTS compatible signals are transmitted and received at the interface device **240** through a POTS interface **380**, such as an RJ11 interface **380**. Thus, in the preferred illustrative embodiment, the interface device **240** comprises a cellular phone docking station **310** that is configured to interface with the cellular telephone **305**, thereby establishing a communications link with the cellular telephone **305**. The cellular phone docking station **310** may also have a tuned antenna **320** that is configured to improve transmission and reception by the cellular telephone **305**, thereby providing a more robust connection to the cellular network through the cellular tower **250** (FIG. **2**). The tuned antenna **320** may be coupled to a cellular telephone antenna **315** in a non-destructive, non-contact, or capacitative manner, for example, using capacitative coupling **325**, as shown in FIG. **3**. In addition to interfacing with a cellular telephone **305** through one of a variety of conventional interfaces (not shown), the cellular phone docking station **310** is configured to receive signaling data through signaling line **355**, which may include commands associated with outgoing telephone calls. Thus, in one illustrative embodiment, the signaling data on signaling line **355** may be indicative of a telephone number.

The received signaling data on signaling line **355** is conveyed to the cellular telephone **305** by the cellular phone docking station **310**, thereby permitting control over certain operations of the cellular telephone **305** using the signaling data on signaling line **355**. In conveying the signaling data on signaling line **355**, the cellular phone docking station **305** may modify the signaling data on signaling line **355** appropriately (e.g., amplify, attenuate, reformat, etc.), or, alternatively, the cellular phone docking station **305** may relay the signaling data on signaling line **355** without modification. Regardless of whether or not the signaling data on signaling line **355** is modified, several aspects of the conveyed signal are discussed below, in greater detail, with reference to other components **350** associated with the interface device **240**. Although the term line is used to describe various non-limiting embodiments, one skilled in the art will be aware that in some embodiments a line carrying signals may be a path on a separate communication media from other signals while the line carrying signals in other embodiments may be a path on a communications media into which many different signals are multiplexed using various multiplexing techniques known to one of ordinary skill in the art. Furthermore, in other embodiments, the signals may be carried by wireless communication media.

In addition to the cellular phone docking station **310**, the interface device **240** comprises an interface controller **370**, an audio relay **365**, a tone generator **375**, and a power supply **335**. The audio relay **365** is configured to exchange analog-audio signals **345** between the POTS devices **140**, **150** (FIG. **2**) and the cellular phone docking station **310**. In this sense, for incoming analog-audio signals **345** (i.e., audio from the cellular telephone **305** to the POTS devices **140**, **150** (FIG. **2**), the audio relay **365** receives analog-audio signals **345** from the cellular phone docking station **310** and transmits the analog-audio signals **345** to the POTS devices **140**, **150** (FIG. **2**) through the POTS interface (e.g., RJ11 interface) **380**. Similarly, for outgoing analog-audio signals **345** (i.e., audio from the POTS devices **140**, **150** (FIG. **2**) to the cellular telephone **305**), the analog audio signals **345** are received by the audio relay **365** through the POTS interface **380** and transmitted to the cellular phone docking station **310**. Thus, the audio relay **365** provides a bi-directional communication link for the analog-audio signals **345** between the POTS devices **140**, **150** (FIG. **2**) and the cellular phone docking station **310**. In a preferred illustrative embodiment, the audio relay **365** is also configured to either amplify or attenuate the analog-audio signals **345** in response to audio-control signals **385** generated by the interface controller **370**. Thus, the behavior of the audio relay **365** is governed by the interface controller **370**, which is discussed in greater detail below.

The tone generator **375** is configured to generate certain tones that are used by the POTS devices **140**, **150** (FIG. **2**). For example, when there is an incoming telephone call, the POTS devices **140**, **150** (FIG. **2**) "ring" to indicate the presence of the incoming telephone call. The tone generator **375**, in such instances, is configured to generate a ring tone, which is then transmitted to the POTS devices **140**, **150** (FIG. **2**) through the POTS interface **380**. The transmitted ring tone indicates to the POTS devices **140**, **150** (FIG. **2**) that they should "ring," thereby notifying the user of the incoming telephone call. The ring tone is generated in response to a ring enable signal on ring enable line **395**, which is discussed below with reference to the interface controller **370**.

In another example, when a user picks up a POTS telephone **140** (FIG. **2**), a dial-tone is produced at the POTS telephone **140** (FIG. **2**). The tone generator **375** is configured to generate the dial tone and transmit the generated dial tone to the POTS telephone **140** (FIG. **2**). The dial tone is generated in response to a dial enable signal on dial enable line **390**, which is also discussed below with reference to the interface controller **370**.

The power supply **335** is configured to provide the components of the interface device **240** with the requisite power. In this sense, the power supply **335** is connected to an external power supply **330** from which it receives external power. The external power is converted by the power supply **335** to a DC voltage, which is used to power the cellular phone docking station **310**, the tone generator **375**, the interface controller **370**, and any other device in the interface device **240** that may be powered by a DC source.

The interface controller **370** is configured to control the behavior of the audio relay **365**, the tone generator **375**, and the cellular phone docking station **310** during the conversion of POTS compatible signals to cellular network compatible signals, and vice versa. Thus, when an outgoing telephone call is placed by one of the POTS devices **140**, **150** (FIG. **2**), the interface controller **370** receives the dialed numbers and converts the dialed numbers to a digital command. The digital command is transmitted as signaling data on signaling line **355** from the interface controller **370** to the cellular phone docking station **310**, which, in turn, transmits the signaling data on signaling line **355** to the cellular telephone **305**. The signaling data, therefore, **355** instructs the cellular telephone **305** to dial the number. In one illustrative embodiment, when the number has been dialed and the called party picks up the phone, the cellular telephone **305** detects the connection and conveys an analog-audio signal **345** to the audio relay **365**. In this illustrative embodiment, the audio relay **365** subsequently indicates to the interface controller **370** that the call is connected, and the interface controller **370** generates an audio-control signal **385**, thereby enabling bi-directional audio communication of analog-audio signals **345** (i.e., talking between the connected parties) through the audio relay **365**. If the party on the POTS telephone **140** (FIG. **2**) disconnects (i.e., hangs up the phone), then the disconnect is detected by the interface controller **370** through the POTS interface **380**. In this illustrative embodiment, the interface controller **370** generates another audio-control signal **385** in response to the disconnect, thereby disabling the audio relay **365** and terminating the bi-directional audio communication between the POTS telephone **140** (FIG. **2**) and the cellular telephone **305**. The interface controller **370** further generates, in response to the disconnect, signaling data on signaling line **355**, which instructs the cellular telephone **305** to stop transmission and reception. If, on the other hand, the cellular telephone **305** disconnects, then this is detected by the audio relay **365** in one illustrative embodiment. The audio relay **365**, in turn, transmits the disconnect information to the interface controller **370**, and the interface controller **370** subsequently generates the audio-control signal **385** to disable the audio relay **365**.

In another illustrative embodiment, information relating to the connected call is transmitted to the interface controller **370** as signaling data on signaling line **355**, rather than as an analog-audio signal **345**. In this illustrative embodiment, the cellular telephone **305** generates signaling data on signaling line **355** when the connection is established. The signaling data on signaling line **355** is received by the interface controller **370**, which generates an audio-control signal **385** in response to the received signaling data on signaling line **355**. The audio-control signal **385** enables the audio relay **365**, thereby permitting bi-directional audio communication between the POTS telephone **140** (FIG. **2**) and the cellular telephone **305**. If the party on the POTS telephone **140** (FIG. **2**) disconnects (i.e., hangs up the phone), then the disconnect is detected by the interface controller **370** through the POTS interface **380**. The interface controller **370** subsequently generates an audio-control signal **385** to disable the audio relay **365**, thereby terminating the bi-directional audio communication between the POTS telephone **140** (FIG. **2**) and the cellular telephone **305**. If, however, the cellular telephone **305** disconnects, then the cellular telephone **305**, in this illustrative embodiment, generates signaling data on signaling line **355** indicative of the disconnected call. The generated signaling data on signaling line **355** is transmitted to the interface controller **370**, which subsequently generates an audio-control signal **385** to disable the audio relay **365**.

In the case of an incoming telephone call, the cellular telephone **305** detects the incoming telephone call and conveys this information to the interface controller **370**. In one illustrative embodiment, the information is conveyed to the interface controller **370** through the audio relay **365**. Thus, in this illustrative embodiment, the incoming telephone call generates an analog-audio signal **345** at the cellular telephone **305**. The analog-audio signal **345** is transmitted from the cellular telephone **305** to the audio relay **365** through the cellular phone docking station **310**, and the audio relay **365** then indicates to the interface controller **370** that there is an incoming call. The interface controller **370** receives this information and generates a ring enable signal on ring enable line **395**. The ring enable signal on ring enable line **395** is received by the tone generator **375**, which generates the ring tone in response to the ring enable signal on ring enable line **395**. The ring tone makes the POTS devices **140**, **150** (FIG. **2**) "ring." When one of the POTS device **140**, **150** (FIG. **2**) is picked up and a connection is established, the interface controller **370** detects the established call and generates signaling data on signaling line **355**, which indicates to the cellular telephone **305** that the connection is established. Additionally, the interface controller **370** generates an audio-control signal **385**, which enables the audio relay **365** for bi-directional audio communication between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305**. When the call ends, the system disconnects as described above.

In another illustrative embodiment, the information is conveyed to the interface controller **370** through signaling data on signaling line **355**. Thus, in this illustrative embodiment, when the cellular telephone **305** detects an incoming telephone call, it generates signaling data on signaling line **355**. The signaling data on signaling line **355** is transmitted to the interface controller **370**, thereby indicating that there is an incoming call. The interface controller **370** receives this information and generates a ring enable signal on ring enable line **395**. The ring enable signal on ring enable line **395** is received by the tone generator **375**, which generates the ring tone in response to the ring enable signal on ring enable line **395**. The tone makes the POTS devices **140**, **150** (FIG. **2**) "ring." When one of the POTS devices **140**, **150** (FIG. **2**) is picked up and a connection is established, the interface controller **370** detects the established call and generates signaling data on signaling line **355**, which indicates to the cellular telephone **305** that the connection is established. Additionally, the interface controller **370** generates an audio-control signal **385**, which enables the audio relay **365** for bi-directional audio communication between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305**. When the call ends, the system disconnects as described above.

FIG. **4** is a block diagram showing the interface controller **370** of FIG. **3** in greater detail. The interface controller **370** is shown in FIG. **4** as comprising a processor **410**, Random-Access Memory (RAM) **460**, Read-Only Memory (ROM) **440**, Static-Random-Access Memory (SRAM) **450**, an off-hook/pulse sensor **430**, and a Dual-Tone Multi-Frequency (DTMF) decoder **420**. The ROM **440** is configured to store the instructions that run the interface controller **370**. In this sense, the ROM **440** is configured to store the program that controls the behavior of the interface controller **370**, thereby allowing the interface controller **370** to convert POTS compatible signals to cellular network compatible signals, and vice versa. The SRAM **450** is adapted to store configuration information, such as whether the system is amenable to 10-digit dialing or 7-digit dialing, international calling protocols, etc. Thus, the SRAM **450** may be adapted differently for systems that are used in different geographical areas, or systems that use different calling protocols. The RAM **460** is configured to store temporary data during the running of the program by the processor **410**. The processor is configured to control the operation of the off-hook/pulse sensor **430**, the DTMF decoder **420**, the tone generator **375**, and the audio relay **365** in accordance with the instructions stored in ROM **440**. Additionally, the processor **410** is configured to generate signaling data on signaling line **355**, which may instruct the cellular telephone **305** (FIG. **3**) to dial a number, disconnect a call, etc. Several of these functions are discussed in detail below with reference to the off-hook/pulse sensor **430** and the DTMF decoder **420**.

The off-hook/pulse sensor **430** is configured to detect when any of the POTS devices **140**, **150** (FIG. **2**) are off-hook and generate an off-hook signal **435** when a POTS device **140**, **150** (FIG. **2**) is detected as being off-hook. In this sense, the off-hook/pulse sensor **430** is connected to the POTS interface **380** (FIG. **3**) through the two-conductor pair wires **130***g*. Thus, when any of the POTS devices **140**, **150** (FIG. **2**) connected to the two-conductor pair **130** go off-hook, the off-hook is detected by the off-hook/pulse sensor **430**, which is also connected to the two-conductor pair **130**. The off-hook/pulse sensor **430** generates an off-hook signal **435** after detecting that a POTS device **140**, **150** (FIG. **2**) is off-hook, and subsequently transmits the off-hook signal **435** to the processor **410**. If the POTS device **140**, **150** (FIG. **2**) is receiving an incoming call, then the off-hook signal **435** indicates that the POTS device **140**, **150** (FIG. **2**) has "picked up" the incoming call, thereby alerting the processor **410** that the processor **410** should establish a bi-directional audio connection between the cellular telephone **305** (FIG. **3**) and the POTS device **140**, **150** (FIG. **2**). If, on the other hand, the POTS device **140**, **150** (FIG. **2**) is placing an outgoing call, then the off-hook signal **435** alerts the processor **410** that a phone number will soon follow. In either event, the off-hook/pulse sensor **430** transmits the off-hook signal **435** to the processor **410**, which, in turn, generates signaling data on signaling line **355** indicative of the POTS device **140**, **150** (FIG. **2**) being off-hook. The signaling data on signaling line **355** is then conveyed, either with or without modification, to the cellular telephone **305** through the cellular phone docking station **310**.

The off-hook/pulse sensor **430** is further configured to detect dialing from POTS devices **140**, **150** (FIG. **2**) that are configured for pulse dialing. Since pulse dialing emulates rapid sequential off-hook signals, the off-hook/pulse sensor **430** receives pulses (i.e., the rapid sequential off-hook signals) and produces a sequence of off-hook signals **435** or pulse-dialing signals. The sequence of off-hook signals **435** is relayed to the processor **410**, which converts the sequence of off-hook signals into signaling data on signaling line **355** that is indicative of the dialed number. The signaling data on signaling line **355** is transmitted from the processor **410** to the cellular telephone **305** through the cellular phone docking station **310**. The cellular telephone **305**, after receiving the signaling data on signaling line **355**, dials the number indicated by the signaling data on signaling line **355**, thereby permitting phone calls by the POTS devices **140**, **150** (FIG. **2**) through the cellular network. In one illustrative embodiment, the numbers dialed by the POTS devices **140**, **150** (FIG. **2**) are stored in RAM **460**, and, once a predetermined number of dialed numbers has been stored, the processor **410** conveys the stored numbers and a "send" command to the cellular telephone. In other words, upon receiving enough digits to dial a telephone number, as indicated by the configuration information in SRAM **450**, the processor **410** commands the cellular telephone **305** to dial the outgoing number, thereby connecting a call from the POTS device **140**, **150** (FIG. **2**) through the cellular network. In another illustrative embodiment, the RAM stores numbers as they are dialed by the POTS devices **140**, **150** (FIG. **2**). If, during dialing, the processor **410** detects a delay or a pause, then the processor **410** presumes that all of the digits of the telephone number have been dialed. Thus, the processor **410** commands the cellular telephone **305** to dial the outgoing number, thereby connecting the call from the POTS device **140**, **150** (FIG. **2**) through the cellular network.

The DTMF decoder **420** is configured to detect dialing from POTS devices **140**, **150** (FIG. **2**) that are configured for DTMF or "tone" dialing. The DTMF decoder **420** receives a tone, which represent a number, through the two-conductor pair **130***n*. After receiving the tone, the DTMF decoder **420** generates a DTMF-dialing signal **425** that is indicative of the number that was dialed. The DTMF-dialing signal **425** is then transmitted to the processor **410**, which converts the DTMF-dialing signal **425** into signaling data on signaling line **355** that is indicative of the number that was dialed. The signaling data on signaling line **355** is transmitted from the processor **410** to the cellular telephone **305** through the cellular phone docking station **310**. The cellular telephone **305** subsequently dials the number indicated by the signaling data on signaling line **355**, thereby allowing the POTS device **140**, **150** (FIG. **2**) to make a call using the cellular network.

It can be seen, from FIGS. **2** through **4**, that the various illustrative embodiments of the system will permit the interfacing of POTS devices **140**, **150** (FIG. **2**) with a cellular network. Specifically, in one illustrative embodiment, POTS devices **140**, **150** (FIG. **2**) are interfaced with the cellular network through a cellular telephone **305** (FIG. **3**), which is attached to the interface device **240** at a cellular phone docking station **310**. In addition to the various systems, as described above, another illustrative embodiment of the invention may be seen as a method for interfacing POTS devices **140**, **150** (FIG. **2**) with cellular networks. Several illustrative embodiments of the method are described with reference to FIGS. **5** through **12** below.

FIG. **5** is a flowchart showing one illustrative embodiment of the method for interfacing POTS devices with cellular networks. In a broad sense, once a POTS device **140**, **150** (FIG. **2**) has been coupled to a cellular telephone **305** (FIG. **3**) through an interface device **240** (FIG. **2**), this illustrative embodiment may be seen as converting, in step **530**, cellular network compatible signals from the cellular telephone **305** (FIG. **3**) to POTS compatible signals, and converting, in step **540**, POTS compatible signals from the POTS devices **140**, **150** (FIG. **2**) to cellular network compatible signals. In a preferred illustrative embodiment, the converting steps **530**, **540** are performed at the interface device **240**.

FIGS. **6**A and **6**B are flowcharts showing one illustrative embodiment of the method associated with the conversion **530** of cellular network compatible signals to POTS compatible signals. As an initial matter, the cellular network compatible signals are received through the cellular telephone **305** (FIG. **3**). Thus, in step **610**, the system receives an incoming call through the cellular telephone **305** (FIG. **3**). Once the incoming call is received **610**, the system further receives, in step **620**, an analog-audio signal **345** (FIG. **3**) indicative of the incoming call from the cellular telephone **305** (FIG. **3**). The received analog-audio signal **345** (FIG. **3**) is then transmitted, in step **630**, to an interface controller **370** (FIG. **3**). The interface controller **370** (FIG. **3**) generates, in step **640**, a ring tone in response to receiving the analog-audio signal **345** (FIG. **3**). In a preferred illustrative embodiment, the ring tone is generated **640** by a tone generator **375** (FIG. **3**). The generated **640** ring tone is conveyed, in step **650**, to the POTS devices **140**, **150** (FIG. **2**), and, when the POTS device **140**, **150** (FIG. **2**) is "picked up," an off-hook signal is generated, in step **660**, and conveyed, in step **670**, to the interface controller **370** (FIG. **3**). This triggers the interface controller **370** (FIG. **3**) to activate the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged, in step **680**, between the POTS devices **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**) through the audio relay **365** (FIG. **3**). Thus, in this illustrative embodiment, once the incoming call is connected between the cellular telephone **305** (FIG. **3**) and the POTS device **140**, **150** (FIG. **2**), the POTS device **140**, **150** (FIG. **2**) freely communicates through the cellular network.

FIGS. **7**A and **7**B are flowcharts showing another illustrative embodiment of the method associated with the conversion **530** of cellular network compatible signals to POTS compatible signals. Similar to FIGS. **7**A and **7**B, the cellular network compatible signals here are received through the cellular telephone **305** (FIG. **3**). Thus, in step **710**, the system receives an incoming call through the cellular telephone **305** (FIG. **3**). However, unlike the illustrative embodiment of FIGS. **6**A and **6**B, once the incoming call is received **710**, the system generates, in step **720**, signaling data on signaling line **355** (FIG. **3**) indicative of the incoming call from the cellular telephone **305** (FIG. **3**). The generated **720** signaling data on signaling line **355** (FIG. **3**) is then conveyed, in step **730**, to an interface controller **370** (FIG. **3**). The interface controller **370** (FIG. **3**) generates, in step **740**, a ring tone in response to signaling data on signaling line **355** (FIG. **3**). In a preferred illustrative embodiment, the ring tone is generated **740** by a tone generator **375** (FIG. **3**). The generated **740** ring tone is conveyed, in step **750**, to the POTS devices **140**, **150** (FIG. **2**), and, when the POTS device **140**, **150** (FIG. **2**) is "picked up," an off-hook signal is generated, in step **760**, and conveyed, in step **770**, to the interface controller **370** (FIG. **3**). This triggers the interface controller **370** (FIG. **3**) to activate the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged, in step **780**, between the POTS devices **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**) through the audio relay **365** (FIG. **3**). Thus, in this illustrative embodiment, once the incoming call is connected between the cellular telephone **305** (FIG. **3**) and the POTS device **140**, **150** (FIG. **2**), the POTS device **140**, **150** (FIG. **2**) freely communicates through the cellular network.

FIG. **8** is a flowchart showing several steps associated with the conversion **540** of POTS compatible signals to cellular network compatible signals. As described above, the interface device **240** (FIG. **2**) is configured to allow outgoing calls using either pulse-dialing or "tone" dialing. The method steps associated with pulse-dialing are different from the method steps associated with "tone" dialing. However, regardless of which type of dialing is employed, both methods share several of the initial steps. FIG. **8** describes the shared initial steps associated with an outgoing call from a POTS device **140**, **150** (FIG. **2**) through the cellular network. When a user "picks up" the phone **140** (FIG. **2**) to place an outgoing call, the system detects, in step **810**, an off-hook signal at the off-hook/pulse detector **430** (FIG. **4**). The system then generates, in step **820**, a dial tone in response to the detected off-hook signal. In an illustrative embodiment, the dial tone is generated **820** by the tone generator **375** (FIG. **3**). The generated **820** dial tone is conveyed, in step **830**, to the POTS device **140**, **150** (FIG. **2**) (i.e., to the person that is placing the outgoing call) to indicate that the system is ready for dialing. In addition to generating **820** the dial tone, the system further generates, in step **840**, signaling data on signaling line **355** (FIG. **3**) that is indicative of the POTS device **140**, **150** (FIG. **2**) being off-hook. The generated **840** signaling data on signaling line **355** (FIG. **3**) is then conveyed, in step **850**, to the cellular telephone **305** (FIG. **3**), either with or without modification, through the cellular phone docking station **310** (FIG. **3**), thereby indicating to the cellular telephone **305** (FIG. **3**) that a user has "picked up" the phone **140** (FIG. **2**), and that an outgoing call may be initiated. Thus, in one illustrative embodiment, once the cellular phone **305** (FIG. **3**) receives the indication that the user has "picked up" the phone **140** (FIG. **2**), the cellular telephone **305** (FIG. **3**) blocks incoming calls. Hence, at this point, the system is ready for either pulse dialing or "tone" dialing. In another illustrative embodiment, the step of generating **840** signaling data on signaling line **355** (FIG. **3**) may be completely.

FIGS. **9** and **10** are flowcharts showing several illustrative embodiments of the method associated with pulse dialing. As shown in FIG. **9**, in one illustrative embodiment, the off-hook/pulse sensor **430** (FIG. **4**) detects, in step **910**, a pulse-dialing signal that is indicative of a pulse-dialed number. In response to the pulse-dialing signal, the processor **410** (FIG. **4**) generates, in step **920**, signaling data on signaling line **355** (FIG. **3**) that is indicative of the pulse-dialed number and a "send" command. The signaling data on signaling line **355** (FIG. **3**) is conveyed, in step **930**, to the cellular telephone **305** (FIG. **3**), either with or without modification (e.g., amplification or attenuation), by the processor **410** (FIG. **4**) through the cellular phone docking station **310** (FIG. **3**).

In one illustrative embodiment, the numbers dialed by the POTS devices **140**, **150** (FIG. **2**) are stored in RAM **460**, and, once a predetermined number of dialed numbers has been stored, the processor **410** (FIG. **4**) conveys the stored numbers and a "send" command to the cellular telephone **305** (FIG. **3**). In other words, upon receiving enough digits to dial a telephone number, as indicated by the configuration information in SRAM **450** (FIG. **4**), the processor **410** (FIG. **4**) commands the cellular telephone **305** (FIG. **3**) to dial the outgoing number, thereby connecting a call from the POTS device **140**, **150** (FIG. **2**) through the cellular network. In another illustrative embodiment, the RAM **460** (FIG. **4**) stores numbers as they are dialed by the POTS devices **140**, **150** (FIG. **2**). If, during dialing, the processor **410** (FIG. **4**) detects a delay or a pause, then the processor **410** (FIG. **4**) presumes that all of the digits of the telephone number have been dialed. Thus, the processor **410** (FIG. **4**) commands the cellular telephone **305** to dial the outgoing number, thereby connecting the call from the POTS device **140**, **150** (FIG. **2**) through the cellular network. The command instructs the cellular telephone **305** (FIG. **3**) to call the number that has been conveyed to the cellular telephone **305** (FIG. **3**) by the signaling data on signaling line **355** (FIG. **3**).

When the called party "picks up" the phone, the system detects, in step **940**, an analog-audio signal **345** (FIG. **3**) that is indicative of the connected call. At this point, the processor **410** (FIG. **4**) enables the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged, in step **950**, between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**). Thus, once the outgoing call is connected between the cellular telephone **305** (FIG. **3**) and the POTS device **140**, **150** (FIG. **2**), the POTS device **140**, **150** (FIG. **2**) freely communicates through the cellular network.

In another illustrative embodiment, rather than waiting for the called party to "pick up" the phone, the system detects an analog-audio signal **345** (FIG. **3**) that is indicative of a called-party telephone ringing or a called-party telephone being "busy." At this point, the processor **410** (FIG. **4**) enables the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**). Thus, once a called-party telephone ringing or a called-party telephone "busy" signal is detected, the cellular telephone **305** (FIG. **3**) and the POTS device **140**, **150** (FIG. **2**) are connected through the cellular network.

FIG. **10** is a flowchart showing, in greater detail, another illustrative embodiment of the method associated with pulse dialing. As shown in FIG. **10**, the off-hook/pulse sensor **430** (FIG. **4**) detects, in step **910**, a pulse-dialing signal that is indicative of a pulse-dialed number. In response to the pulse-dialing signal, the processor **410** (FIG. **4**) generates, in step **920**, signaling data on signaling line **355** (FIG. **3**) that is indicative of the pulse-dialed number. The signaling data on signaling line **355** (FIG. **3**) is conveyed, in step **930**, to the cellular telephone **305** (FIG. **3**), either with or without modification, by the processor **410** (FIG. **4**) through the cellular phone docking station **310** (FIG. **3**). This instructs the cellular telephone **305** (FIG. **3**) to call the number that has been conveyed to the cellular telephone **305** (FIG. **3**) by the signaling data on signaling line **355** (FIG. **3**). When the called party "picks up" the phone, the cellular telephone **305** (FIG. **3**) generates signaling data on signaling line **355** (FIG. **3**) that is indicative of the connected call, and the processor detects, in step **1040**, the signaling data on signaling line **355** (FIG. **3**). At this point, the processor **410** (FIG. **4**) enables the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged, in step **950**, between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**). Thus, again, the POTS device **140**, **150** (FIG. **2**) freely communicates through the cellular network.

In another illustrative embodiment, rather than waiting for the called party to "pick up" the phone, the system detects an analog-audio signal **345** (FIG. **3**) that is indicative of a called-party telephone ringing or a called-party telephone being "busy." At this point, the processor **410** (FIG. **4**) enables the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**). Thus, once a called-party telephone ringing or a called-party telephone "busy" signal is detected, the cellular telephone **305** (FIG. **3**) and the POTS device **140**, **150** (FIG. **2**) are connected through the cellular network.

FIGS. **11** and **12** are flowcharts showing several illustrative embodiments of the method associated with "tone" dialing. As shown in FIG. **11**, in one illustrative embodiment, the DTMF decoder **420** (FIG. **4**) detects, in step **1110**, a DTMF signal that is indicative of a DTMF-dialed number. In response to the DTMF signal, the processor **410** (FIG. **4**) generates, in step **1120**, signaling data on signaling line **355** (FIG. **3**) that is indicative of the DTMF-dialed number. The signaling data on signaling line **355** (FIG. **3**) is conveyed, in step **1130**, to the cellular telephone **305** (FIG. **3**), either with or without modification, by the processor **410** (FIG. **4**) through the cellular phone docking station **310** (FIG. **3**). This instructs the cellular telephone **305** (FIG. **3**) to call the number that has been conveyed to the cellular telephone **305** (FIG. **3**) by the signaling data on signaling line **355** (FIG. **3**). When the called party "picks up" the phone, the system detects, in step **1140**, an analog-audio signal **345** (FIG. **3**) that is indicative of the connected call. At this point, the processor **410** (FIG. **4**) enables the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged, in step **1150**, between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**). Thus, once the incoming call is connected between the cellular telephone **305** (FIG. **3**) and the POTS device **140**, **150** (FIG. **2**), the POTS device **140**, **150** (FIG. **2**) freely communicates through the cellular network.

FIG. **12** is a flowchart showing another illustrative embodiment of the method associated with "tone" dialing. As shown in FIG. **12**, the DTMF decoder **420** (FIG. **4**) detects, in step **1110**, a DTMF signal that is indicative of a DTMF-dialed number. In response to the DTMF signal, the processor **410** (FIG. **4**) generates, in step **1120**, signaling data on signaling line **355** (FIG. **3**) that is indicative of the DTMF-dialed number. The signaling data on signaling line **355** (FIG. **3**) is conveyed, in step **1130**, to the cellular telephone **305** (FIG. **3**), either with or without modification, by the processor **410** (FIG. **4**) through the cellular phone docking station **310** (FIG. **3**). This instructs the cellular telephone **305** (FIG. **3**) to call the number that has been conveyed to the cellular telephone **305** (FIG. **3**) by the signaling data on signaling line **355** (FIG. **3**). When the called party "picks up" the phone, the cellular telephone **305** (FIG. **3**) generates signaling data on signaling line **355** (FIG. **3**) that is indicative of the connected call, and the processor detects, in step **1240**, the signaling data on signaling line **355** (FIG. **3**). At this point, the processor **410** (FIG. **4**) enables the audio relay **365** (FIG. **3**), and analog-audio signals **345** (FIG. **3**) are exchanged, in step **1150**, between the POTS device **140**, **150** (FIG. **2**) and the cellular telephone **305** (FIG. **3**). Thus, again, the POTS device **140**, **150** (FIG. **2**) freely communicates through the cellular network.

While several hardware components are shown with reference to FIGS. **3** and **4** to describe the interface controller **370**, it will be clear to one of ordinary skill in the art that the interface controller **370** may be implemented in hardware, software, firmware, or a combination thereof. In one illustrative embodiment, the interface controller **370** (FIG. **3**) is implemented in software or firmware that is stored in a memory and that is executed by a suitable instruction execution system. If implemented in hardware, as in FIGS. **3** and **4**, the interface controller may be implemented with any or a combination of the following technologies: a discrete logic circuit having logic gates for implementing logic functions upon data signals, an Application Specific Integrated Circuit (ASIC) having appropriate combinational logic gates, a Programmable Gate Array (PGA), a Field Programmable Gate Array (FPGA), etc.

FIG. **13** is a block diagram showing a communications system **1300** including an interface device **1302** that is an alternative illustrative embodiment of the interface device **240** of FIG. **3**. According to this embodiment, the interface device **1302** provides additional functionality, allowing any number of devices and networks to communicate with any number of additional devices and networks. In doing so, the interface device **1302** acts as a gateway for information, receiving and translating data between various formats for transmission over any type of transmission medium. As used herein, data comprises audio, video, voice, text, images, rich media, and any combination thereof.

Turning now to FIG. **13**, the interface device **1302** provides communications between at least one of the devices **1358***a*, **1358***b* and at least one of the user devices **1322***a*-**1322***n*. Communications provided between the devices **1358***a*, **1358***b* and the user devices **1322***a*-**1322***n* via the interface device **1302** may include data comprising audio, video, voice, text, images, rich media, or any combination thereof. The devices **1358***a*, **1358***b* and the user devices **1322***a*-**1322***n* may include communications devices capable of sending and receiving communications including, but not limited to, cellular telephones, VoIP phones, WI-FI phones, POTS phones, computers, Personal Data Assistants (PDAs), Digital Video Recorders (DVRs), and televisions. According to one embodiment, the devices **1358***a*, **1358***b* may be associated with communications networks **1320***a*, **1320***b* such that communications provided by the devices are sent via the communications networks, and communications directed to the devices are delivered via the communications networks. Similarly, the user devices may be associated with communications networks such that communications provided by the user devices are sent via the communications networks, and communications directed to the user devices are delivered via the communications networks as illustrated by the user devices **1322***a*-**1322***n* and the communications networks **1356***a*, **1356***b* in FIG. **13**. The communications networks **1320***a*, **1320***b* and **1356***a*, **1356***b* may include a wireless network such as, but not limited to, a Wireless Local Area Network (WLAN) such as a WI-FI network, a Wireless Wide Area Network (WWAN), a Wireless Personal Area Network (WPAN) such as BLUETOOTH, a Wireless Metropolitan Area Network (WMAN) such a Worldwide Interoperability for Microwave Access (WiMax) network, or a cellular network. Alternatively, the communications networks **1320***a*, **1320***b* and **1356***a*, **1356***b* may be a wired network such as, but not limited to, a wired Wide Area Network (WAN), a wired

(Local Area Network) LAN such as the Ethernet, a wired Personal Area Network (PAN), or a wired Metropolitan Area Network (MAN).

The interface device **1302** may include at least one interface **1306** for communicating directly with the device **1358***b* and for communicating with the communications network **1320***b* associated with the device **1358***b*. It will be appreciated by those skilled in the art that the interface **1306** may comprise a wireline or wireless adapter for communicating with the device **1358***b* and with the communications network **1320***b*, which may include one of the wired or wireless networks described above. The interface **1306** may conform to a variety of wired network standards for enabling communications between the interface device **1302** and the device **1358***b* via a wired signaling connection **1364** and between the interface device and the communications network **1320***b* via a wired signaling connection **1342**. The interface **1306** may include, but is not limited to, a coaxial cable interface conformed to MPEG standards, POTS standards, and Data Over Cable Service Specifications (DOCSIS). The interface **1306** may also conform to Ethernet LAN standards and may include an Ethernet interface, such as an RJ45 interface (not shown). The interface **1306** may further include a twisted pair interface conformed to POTS standards, Digital Subscriber Line (DSL) protocol, and Ethernet LAN standards. Moreover, the interface **1306** may include a fiber optics interface conformed to Synchronous Optical Network (SONET) standards and Resilient Packet Ring standards. It will be appreciated that the interface **1306** may also conform to other wired standards or protocols such as High Definition Multimedia Interface (HDMI).

The interface **1306** may further conform to a variety of wireless network standards for enabling communications between the interface device **1302** and the device **1358***b* via a wireless signaling connection **1366** and between the interface device and the communications network **1320***b* associated with the device via a wireless signaling connection **1340**. The interface **1306** may include a cellular interface conformed to Advanced Mobile Phone System (AMPS) standards, Global System for Mobile Communications (GSM) standards, and Cellular Digital Packet Data (CDPD) standards for enabling communications between the interface device **1302** and the communications network **1320***b*. The interface **1306** may also include a WI-FI interface conformed to the 802.11x family of standards (such as 802.11a, 802.11b, and 802.11g). The interface **1306** may further include a WiMax interface conformed to the 802.16 standards. Moreover, the interface **1306** may include at least one of a satellite interface conformed to satellite standards or a receiver conformed to over-the-air broadcast standards such as, but not limited to, National Television System Committee (NTSC) standards, Phase Alternating Line (PAL) standards, and high definition standards. It will be appreciated that the interface **1306** may also conform to other wireless standards or protocols such as BLUETOOTH, ZIGBEE, and Ultra Wide Band (UWB). According to various embodiments, the interface device **1302** may include any number of interfaces **1306**, each conformed to at least one of the variety of wired and wireless network standards described above for receiving data in a variety of formats from multiple devices and networks via multiple transmission media.

In an embodiment, the interface device **1302** may communicate with the device **1358***a* and with the communications network **1320***a* associated with the device **1358***a* via a relay device **1324**. The relay device **1324** operates as a transceiver for the interface device **1302** to transmit and receive data to and from the device **1358***a* and the communications network **1320***a*. The relay device **1324** may modify the signaling data appropriately (e.g., amplify, attenuate, reformat, etc.), or, alternatively, the relay device **1324** may relay the signaling data without modification. Additionally, the relay device **1324** may be fixed, or may be portable to provide a user with a remote means for accessing data from a network or other device via the interface device **1302**. Examples of fixed relay devices include, but are not limited to, a DSL modem, a cable modem, a set top device, and a fiber optic transceiver. Examples of portable relay devices include portable communications devices such as, but not limited to, a cellular telephone, a WI-FI telephone, a VoIP telephone, a PDA, a satellite transceiver, or a laptop.

The relay device **1324** may also include a combination of a fixed device and a portable device. For example, the relay device **1324** may comprise a cellular telephone in combination with a docking station. The docking station remains connected to the interface device **1302**, through wired or wireless means, while the cellular telephone may be removed from the docking station and transported with a user. In this embodiment, data received from the interface device **1302** at the cellular telephone may be taken with the user to be utilized at a remote location. While the cellular telephone is not docked with the docking station, communication would occur between the device **1358***a* and the interface device **1302** as well as between the communications network **1320***a* and the interface device via a direct connection or via an alternate relay device.

The device **1358***a* may provide data via signals which are transmitted either over a wireless signaling connection **1360** or over a wired signaling connection **1362** directly to the relay device **1324**. Alternatively, the communications network **1320***a* associated with the device **1358***a* may provide data via signals which are transmitted either over a wireless signaling connection **1334** or over a wired signaling connection **1338** to the relay device **1324**. The data may include audio, video, voice, text, rich media, or any combination thereof. Signals provided by the device **1358***a* over the wireless signaling connection **1360** to the relay device **1324** and signals provided by the communications network **1320***a* over the wireless signaling connection **1334** to the relay device may be in a format compatible with a cellular network, a WI-FI network, a WiMax network, a BLUETOOTH network, or a satellite network. Signals provided by the device **1358***a* over the wired signaling connection **1362** to the relay device **1324** and signals provided by the communications network **1320***a* over the wired signaling connection **1338** may be in a format compatible with a DSL modem, a cable modem, a coaxial cable set top box, or a fiber optic transceiver.

Once the relay device **1324** receives data from the device **1358***a* or from the communications network **1320***a*, the relay device may transmit the data to an interface **1304** associated with the interface device **1302** via a signal over a wireless signaling connection **1334** or a wired signaling connection **1338**. In one embodiment, the device **1358***a* and the communications network **1320***a* may communicate both directly with the interface device **1302** through the interface **1304** and with the interface device via the relay device **1324** through the interface **1304**. The interface **1304** may conform to a variety of wireless network standards for enabling communications between the interface device **1302** and the relay device **1324**. The interface **1304** may include a cellular interface conformed to AMPS, GSM standards, and CDPD standards for enabling communications between the interface device **1302** and the relay device **1324**. The interface **1304** may also include a WI-FI interface conformed to the 802.11x family of standards (such as 802.11a, 802.11b, and 802.11g). The interface **1304** may further include a WiMax interface conformed to the 802.16 standards. Moreover, the interface **1304** may include at least one of a cordless phone interface or a proprietary wireless interface. It will be appreciated by one skilled in the art that the interface **1304** may also conform to other wireless standards or protocols such as BLUETOOTH, ZIGBEE, and UWB.

The interface **1304** may also conform to a variety of wired network standards for enabling communications between the interface device **1302** and the relay device **1324**. The interface **1304** may include, but is not limited to, microphone and speaker jacks, a POTS interface, a USB interface, a FIREWIRE interface, a HDMI, an Enet interface, a coaxial cable interface, an AC power interface conformed to Consumer Electronic Bus (CEBus) standards and X.10 protocol, a telephone interface conformed to Home Phoneline Networking Alliance (HomePNA) standards, a fiber optics interface, and a proprietary wired interface.

Signals provided by the relay device **1324** over the wireless signaling connection **1334** to the interface **1304** may be in a format compatible with a cellular network, a WI-FI network, a WiMax network, a BLUETOOTH network, or a proprietary wireless network. Signals provided over the wired signaling connection **1338** to the interface **1304** may be in a format compatible with microphone and speaker jacks, a POTS interface, a USB interface, a FIREWIRE interface, an Enet interface, a coaxial cable interface, an AC power interface, a telephone interface, a fiber optics interface, or a proprietary wired interface.

Data received at the interfaces **1304**, **1306** either directly from the devices **1358***a*, **1358***b* and the communications networks **1320***a*, **1320***b* or via the relay device **1324** is provided to an interface controller **1308** via a signaling line **1316**. The interface controller **1308** is similar to the interface controller **370** of the interface device **240** described above with respect to FIG. **3**. Once the interface controller **1308** receives data from the devices **1358***a*, **1358***b* or the communications networks **1320***a*, **1320***b*, the interface controller **1308** identifies one or more of the user devices **1322***a*-**1322***n* and/or one or more of the communications networks **1356***a*, **1356***b* to receive the data, identifies a format compatible with the one or more receiving devices and/or receiving networks, and translates the current format of the data to the format compatible with the one or more receiving devices and/or receiving networks, which is further discussed below. After the data is translated, the interface controller **1308** provides the data to one or more of the interfaces **1326**, **1328**, and **1330** associated with the one or more devices and or networks identified to receive the translated data via a signaling line **1318**. For example, if the interface controller **1308** identifies a POTS telephone as the device to receive the translated data, then the interface controller provides the data via the signaling line **1318** to an interface compatible with POTS standards.

The interface controller **1308** is further configured to receive data from the user devices **1322***a*-**1322***n* and the communications networks **1356***a*, **1356***b*, identify one or more of the devices **1358***a*, **1358***b* and/or one or more of the communications network **1320***a*, **1320***b* to receive the data, identify a format compatible with the one or more receiving devices and/or receiving networks, and translate the current format of the data to the format compatible with the one or more receiving devices and/or receiving networks. Thus, the interface controller **1308** provides a bi-directional communication for all data transmitted between the devices **1358***a*, **1358***b* and the user devices **1322***a*-**1322***n*, between the devices **1358***a*, **1358***b* and the communications networks **1356***a*, **1356***b*, between the communications networks **1320***a*, **1320***b* and the user devices **1322***a*-**1322***n*, and between the communication networks **1320***a*, **1320***b* and the communications network **1356***a*, **1356***b*. In an illustrative embodiment, the interface controller **1308** is also configured to either amplify or attenuate the signals carrying the data transmitted between the communications networks and the devices.

The interfaces **1326**, **1328**, and **1330** may transmit the data to the user devices **1322***a*-**1322***n* directly, as illustrated by the interface **1330** in FIG. **13**, or the interfaces **1326**, **1328**, and **1330** may transmit the data to the communications networks **1356***a*, **1356***b* associated with the devices **1322***a*, **1322***b*, as illustrated by the interfaces **1326**, **1328** in FIG. **13**. In either case, the interfaces **1326**, **1328**, and **1330** transmit the data via a signal over wireless signaling connections **1346**, **1350**, and **1354** or wired signaling connections **1344**, **1348**, and **1352**, respectively. In another embodiment, one of the interfaces **1326**, **1328**, and **1330** may communicate the data to two or more of the devices **1322***a*-**1322***n* and/or communications networks **1356***a*, **1356***b*.

The interfaces **1326**, **1328**, and **1330** may conform to a variety of wireless network standards for enabling communications between the interface device **1302** and the devices **1322***a*-**1322***n* or the communications networks **1356***a*, **1356***b*. The interfaces **1326**, **1328**, and **1330** may include at least one cellular interface conformed to AMPS, GSM standards, and CDPD standards for enabling communications between the interface device **1302** and the devices **1322***a*, **1322***b*, and **1322***n*. The interfaces **1326**, **1328**, and **1330** may also include at least one WI-FI interface conformed to the 802.11x family of standards (such as 802.11a, 802.11b, and 802.11g). The interfaces **1326**, **1328**, and **1330** may further include at least one WiMax interface conformed to the 802.16 standards. Moreover, the interfaces **1326**, **1328**, and **1330** may include at least one of a cordless phone interface or a proprietary wireless interface. It will be appreciated by those skilled in the art that the interfaces **1326**, **1328**, and **1330** may also conform to other wireless standards or protocols such as BLUETOOTH, ZIGBEE, and UWB.

The interfaces **1326**, **1328**, and **1330** may transmit the data to the user devices **1322***a*-**1322***n* directly, as illustrated by the interface **1330** in FIG. **13**, or the interfaces **1326**, **1328**, and **1330** may transmit the data to the communications networks **1356***a*, **1356***b* associated with the devices **1322***a*, **1322***b*, as illustrated by the interfaces **1326**, **1328** in FIG. **13**. In either case, the interfaces **1326**, **1328**, and **1330** transmit the data via a signal over wireless signaling connections **1344**, **1348**, and **1352** or wired signaling connections **1346**, **1350**, and **1354**, respectively. In another embodiment, one of the interfaces **1326**, **1328**, and **1330** may communicate the data to two or more of the devices **1322***a*-**1322***n* and/or communications networks **1356***a*, **1356***b*.

Signals provided by the interfaces **1326**, **1328**, and **1330** over the wireless signaling connections **1344**, **1348**, and **1352** may be in a format compatible with a cellular network, a WI-FI network, a WiMax network, a BLUETOOTH network, or a proprietary wireless network. Signals provided over the wired signaling connections **1346**, **1350**, and **1354** may be in a format compatible with microphone and speaker jacks, a POTS interface, a USB interface, a FIREWIRE interface, an Enet interface, a coaxial cable interface, an AC power interface, a telephone interface, a fiber optics interface, or a proprietary wired interface.

For some interfaces such as, but not limited to, POTS interfaces, functionality of the interfaces that provide service from a network to a user device is different from the functionality of the interfaces that receive service from the network. Interfaces that deliver service from a network to a user device are commonly referred to as Foreign eXchange Subscriber (FXS) interfaces, and interfaces that receive service from the network are commonly referred to as Foreign eXchange Office (FXO) interfaces. In general, the FXS interfaces provide the user device dial tone, battery current, and ring voltage, and the FXO interfaces provide the network with on-hook/off-hook indications. In an embodiment, the interfaces **1326**, **1328**, and **1330** are the FXS interfaces that deliver data from the communications networks **1320***a*, **1320***b* to the user devices **1322***a*-**1322***n*, and the interfaces **1304**, **1306** are the FXO interfaces that receive data from the communications networks **1320***a*, **1320***b*.

As mentioned above, the interface controller **1308** may control the translation of the data received at the interface device **1302** from one format to another. In particular, the interface controller **1308** is configured to control the behavior of the relay device **1324** and any additional components necessary for translating data in order to effectuate the translation of the data from one format to another format. For example, as described above, for translating between POTS compatible signals and cellular network compatible signals, the interface controller **1308** may communicate with an audio relay and a tone generator, and includes an off-hook/pulse sensor and a DTMF decoder. The interface device **1302** shares the same capabilities for translating between POTS compatible signals and cellular network compatible signals as described above with regard to the interface device **240** illustrated in FIG. **3**, but the interface device **1302** also has additional translation capabilities for translating between any number and type of other signals. Consequently, the interface device **1302** may comprise any components necessary for a given translation.

According to one embodiment, the interface controller **1308** comprises a processor, RAM, and non-volatile memory including, but not limited to ROM and SRAM. The non-volatile memory is configured to store logic used by the interface controller **1308** to translate data received at the interface device **1302**. In this sense, the non-volatile memory is configured to store the program that controls the behavior of the interface controller **1308**, thereby allowing the interface controller **1308** to translate data signals from one format to another. The non-volatile memory is also adapted to store configuration information and may be adapted differently depending on geographical area and signal formats and protocols. The configuration information stored on the non-volatile memory of the interface controller **1308** may include default configuration information originally provided on the interface device **1302**. In another embodiment, the configuration information may include a user profile associated with one or more of the devices **1322***a*-**1322***n*, one or more of the communications networks **1356***a*, **1356***b*, or a combination thereof. The user profile may include user preferences established by one or more users of the interface device **1302** regarding formats in which data is to be transmitted and received, translations to be performed on the data, the devices and networks to send and receive the data, as well as any other configuration information associated with transmitting data via the interface device **1302**. The RAM is configured to store temporary data during the running of the program by the processor, allowing the RAM to operate as a memory buffer for times in which the data is being received at a rate that is faster than the interface device **1302** can determine a proper recipient, translate the data, and transmit the data to the proper recipient. The processor is configured to generate signaling data on the signaling line **1316**, which may instruct the relay device **1324** to dial a number, connect to a network, etc.

As mentioned above, the interface device **1302** contains logic within the interface controller **1308** that is used by the interface controller to translate data received at the interface device. The logic may include any number and type of data translation standards. In particular, the interface controller **1308** uses the logic to translate the data received at one of the interfaces **1304**, **1306**, **1326**, **1328**, **1330** of the interface device **1302** from at least one format to at least one other format. How the data received at the interface device **1302** is translated may be based on any one or combination of factors. According to one embodiment, the type of data translation may depend on the source and destination of the data. It should be understood that although the description contained herein describes the devices **1358***a*, **1358***b* and the communications networks **1320***a*, **1320***b* as the source devices and the source networks, respectively, and the user devices **1322***a*-**1322***n* and the communications networks **1356***a*, **1356***b* as the destination devices and the destination networks, respectively, embodiments contemplate data transfer from the user devices **1322***a*-**1322***n* and from the communications networks **1356***a*, **1356***b* to the devices **1358***a*, **1358***b* and to the communications networks **1320***a*, **1320***b* as well as bidirectional communication and data transfer. As an example, data arriving at the interface device **1302** that is directed to a POTS device would be translated to a format compatible for transmission over the appropriate medium associated with the POTS device.

According to another embodiment, the type of data translation may depend on default configuration information originally provided on the interface device **1302**. For example, the default configuration information may be provided by a service provider offering the interface device **1302** to customers. In yet another embodiment, the type of data translations may depend on a user profile stored on the interface device **1302**. As discussed above, the user profile may be configured by a user of the interface device **1302** to include user preferences regarding formats in which data is to be transmitted and received, translations to be performed on the data, the devices and networks to send and receive the data, as well as any other configuration information associated with transmitting data via the interface device **1302**.

When configuring the user profile, the user may specify the appropriate destination device, transmission medium, and filtering options for data received under any variety of circumstances. For example, the user may configure the interface device **1302** such that all incoming rich media content is translated for transmission to and display on the device **1322***b* which, as discussed above, may include a television. The user might configure the interface device **1302** such that only media from specific websites be allowed to download to a device or network via the interface device **1302**. In doing so, the user profile might include access data such as a user name and password that will be required from the user prior to accessing a specific type or quantity of data. The user profile may additionally contain priorities for translation and transmission when multiple data signals and data formats are received at the interface device **1302**. For example, a user may specify that audio data be given transmission priority over other types of data. The priority may be based on a specific transmitting or receiving device, the type of transmitting or receiving device, the format of the data being transmitted or received, the transmission medium of the transmitting or receiving signals, or any other variable. As used herein, the format associated with the data may include a transmission medium associated with the signal carrying the data, a standard associated with the data, or the content of the data.

It should be understood by one skilled in the art that data translations as discussed above may include several different types of data conversion. First, translating data may include converting data from a format associated with one transmission medium to another transmission medium. For example, audio data from an incoming telephone call may be translated from a wireless, cellular signal to a twisted pair wiring signal associated with POTS telephones. Next, data translation may include converting data from one type to another, such as when voice data from a telephone or network is translated into text data for display on a television or other display device. For example, data translation may include, but is not limited to, MPEG 2 translation to MPEG 4 or the reverse, Synchronized Multimedia Interface Language (SMIL) translation to MPEG 1, or Macromedia Flash to MPEG 4.

Additionally, data translation may include content conversion or filtering such that the substance of the data is altered. For example, rich media transmitted from one or more of the devices **1358***a*, **1358***b* or one or more of the communications networks **1320***a*, **1320***b* may be filtered so as to extract only audio data for transmittal to one or more of the user devices **1322***a*-**1322***n* or one or more of the communications networks **1356***a*, **1356***b*. Translation may further include enhancing the data, applying equalizer settings to the data, improving a poor quality signal carrying data based on known characteristics of the device providing the data signal, degrading the data signal, or adding a digital watermark to the data to identify the device or the network associated with the data or the user sending the data. Translation may further include adding information to the data and annotating the data. Moreover, translation may include any combination of the above types of data conversions.

In one embodiment, data received at the interface controller **1308** may include a request for data. It should be understood that the request may be dialed telephone numbers, an IP address associated with a network or device, or any other communication initiating means. When a request for data is provided by one of the user devices **1322***a*-**1322***n*, the devices **1358***a*, **1358***b*, the communications networks **1320***a*, **1320***b*, or the communications networks **1356***a*, **1356***b*, the interface controller **1308** receives the request and converts the request to a digital command. The digital command is transmitted as signaling data either on the signaling line **1316** to one or more of the interfaces **1304**, **1306** or on the signaling line **1318** to one or more of the interfaces **1326**, **1328**, and **1330** based on the devices and/or communications networks identified to receive the request. Once received at one or more of the interfaces **1304**, **1306** or one or more of the interfaces **1326**, **1328**, and **1330**, the signaling data is transmitted to the destination devices and/or communications networks either directly or via the relay device **1324**. If the signaling data is transmitted to the relay device **1324**, the signaling data instructs the relay device to make the required connection to the identified devices **1358***a*, **1358***b* and/or the identified communications networks **1320***a*, **1320***b*.

When a connection is made between the device **1358***a* and one or more of the user devices **1322***a*-**1322***n*, between the device **1358***a* and one or more of the communications networks **1356***a*, **1356***b*, between the communications network **1320***a* and one or more of the user devices **1322***a*-**1322***n*, or between the communication network **1320***a* and one or more of the communications network **1356***a*, **1356***b* in response to a request for data, the relay device **1324** detects the connection and conveys a signal to the interface controller **1308**. In this illustrative embodiment, in response to receiving the signal from the relay device **1324**, the interface controller **1308** enables bi-directional communication of the requested data. If one of the devices and/or communications networks that requested the data disconnects, then the disconnect is detected by the interface controller **1308**. In this illustrative embodiment, the interface controller **1308** terminates the bi-directional communication by generating another signal which instructs the relay device **1324** to stop transmission and reception of the data. If, on the other hand, the relay device **1324** disconnects, then this is detected by the interface controller **1308** which, in response, terminates the bi-directional communication by stopping transmission and reception of the data.

While hardware components are shown with reference to FIG. **13** to describe the interface controller **1308**, it will be clear to one of ordinary skill in the art that the interface controller **1308** may be implemented in hardware, software, firmware, or a combination thereof. In one illustrative embodiment, the interface controller **1308** is implemented in software or firmware that is stored in a memory and that is executed by a suitable instruction execution system. If implemented in hardware, as in FIG. **13**, the interface controller **1308** may be implemented with any or a combination of the following technologies including, but not limited to, a discrete logic circuit having logic gates for implementing logic functions upon data signals, an ASIC having appropriate combinational logic gates, a PGA, a FPGA, other adaptive chip architectures, etc.

The power supply **1312** is configured to provide the components of the interface device **1302** with the requisite power similar to the power supply **335** discussed above in view of FIG. **3**. In this sense, the power supply **1312** is connected to an external power supply **1314** from which it receives external power. The external power is converted by the power supply **1312** to a DC voltage, which is used to power the components of interface device **1302** and optionally, the relay device **1324**.

Referring now to FIG. **14**, additional details regarding the operation of the interface device **1302** for providing communications between a first device and a second device will be discussed. It should be appreciated that the logical operations of the various embodiments are implemented (1) as a sequence of computer implemented acts or program modules running on a computing system and/or (2) as interconnected machine logic circuits or circuit modules within the computing system. The implementation is a matter of choice dependent on the performance requirements of the computing system implementing exemplary embodiments. Accordingly, the logical operations of FIG. **14** and other flow diagrams and making up the embodiments described herein are referred to variously as operations, structural devices, acts or modules. It will be recognized by one skilled in the art that these operations, structural devices, acts and modules may be implemented in software, in firmware, in special purpose digital logic, and any combination thereof without deviating from the spirit and scope of exemplary embodiments as recited within the claims attached hereto.

The routine **1400** begins at operation **1402**, where data is received in a first format from a first device **1321**. The data is received at an interface **1304** of interface device **1302**. The interface device **1302** identifies a second device **1322** for receiving the data at operation **1404**. This identification may depend upon a user profile stored within the interface device **1302**. Alternatively, identifying a second device may comprise selecting a second device that is compatible with the signal type or transmission medium corresponding to the data received at interface **1304**. After identifying the second device **1322**, the interface device **1302** identifies a second format compatible with the second device **1322** at operation **1406**. Similarly, this process may be based on a user profile or on the characteristics of the second device **1322**. For example, the second device may be selected based on a user profile that instructs a POTS telephone to receive all media received at interface **1304**. Because the POTS telephone does not have the capability to display video, the interface device **1302** may identify the second format as containing only the audio portion of the received media.

At operation **1408**, the data is translated to the second format for transmittal to the second device **1322**. The data is then transmitted to the second device **1322** at operation **1410**. The communications capabilities of interface device **1302** are bi-directional. At operation **1412**, data is received in a second format from the second device **1322**. This data is translated to the first format at operation **1414**. After transmitting the translated data to the first device **1321** at operation **1416**, the routine **1400** continues to operation **1418**, where it ends.

Turning now to FIG. **15**, an illustrative routine **1500** will be described illustrating a process for interfacing devices with communications networks. The routine **1500** begins at operation **1502**, where the interface **1304** associated with the interface device **1302** receives data in a first format from the communications network **1320***a* via the relay device **1324**. As discussed above, the interface **1304** may conform to a variety of wireless or wired network standards such that the interface may receive a variety of types of data via a variety of types of signals.

Once the data is received at the interface **1304**, the routine **1500** continues to operation **1504**, where the data is transmitted via the signaling line **1316** to the interface controller **1308**. At operation **1506**, the interface controller **1308** identifies at least one of the devices **1322***a*-**1322***n* to receive the data from the communications network **1320***a*. As discussed above in view of FIG. **13**, the interface controller **1308** may identify which of the devices **1322***a*-**1322***n* should receive the data based on compatibility with the communications networks associated with each of the devices, a user profile stored on the interface device **1302**, or instructions from the communications network **1320***a* that provided the data as to which of the devices should receive the data.

After the interface controller **1308** identifies at least one of the devices **1322***a*-**1322***n* to receive the data, the routine **1500** proceeds to operation **1508**, where the interface controller **1308** identifies a second format compatible with the communications network associated with the at least one device identified from the devices **1322***a*-**1322***n* to receive the data. The routine **1500** then proceeds to operation **1510**, where the interface controller **1308** determines whether the first format of the data is the same as the second format compatible with the communications network associated with the at least one device identified from the devices **1322***a*-**1322***n* to receive the data. If the formats are the same, then the routine **1500** proceeds to operation **1514**. If the formats are not the same, then the routine **1500** proceeds to operation **1512**, where the interface controller **1308** translates the data from the first format to the second format compatible with the communications network associated with the at least one device identified from the devices **1322***a*-**1322***n* to receive the data. The routine **1500** then proceeds to operation **1514**.

At operation **1514**, the interface controller **1308** transmits the data, whether translated or not, through at least one of the interfaces **1326**, **1328**, and **1330** associated with the at least one device identified from the devices **1322***a*-**1322***n* to the device identified from the devices **1322***a*-**1322***n* to receive the data via either a wireless or wired signaling connection. As discussed above with regard to FIG. **13**, the interfaces **1326**, **1328**, and **1330** may be conformed to a variety of wired and wireless network standards so that the interfaces can transmit a variety of types of data via a variety of types of signals. From operation **1514**, the routine **1500** continues to operation **1516**, where it ends.

It will be appreciated that embodiments provide methods, systems, apparatus, and computer-readable medium for interfacing devices with communications networks. Although exemplary embodiments have been described in language specific to computer structural features, methodological acts and by computer readable media, it is to be understood that exemplary embodiments defined in the appended claims is not necessarily limited to the specific structures, acts or media described. Therefore, the specific structural features, acts and mediums are disclosed as exemplary embodiments implementing the claimed invention.

The various embodiments described above are provided by way of illustration only and should not be construed to limit the invention. Those skilled in the art will readily recognize various modifications and changes that may be made to exemplary embodiments without following the example embodiments and applications illustrated and described herein, and without departing from the true spirit and scope of the exemplary embodiments, which are set forth in the following claims.

What is claimed is:

**1**. An interface device for providing communications between a first communications network and a first device associated with a second communications network, comprising:

at least one input for receiving data in a first format from the first communications network;

logic configured for accessing a profile associated with the interface device to determine at least one of the second communications network for transmitting the data, the first device associated with the second communications network for transmitting the data, or translations to be performed on the data;

logic configured for altering substance of the data, wherein altering the substance of the data includes improving a poor quality signal carrying the data based on known characteristics of a second device providing the signal carrying the data, adding a digital watermark to the data to identify at least one of the first communications network or a user sending the data, adding information to the data, and annotating the data;

logic configured for translating the data to a second format compatible with the second communications network, wherein at least one of the first or second formats comprise one of a national television system committee standard, a phase alternating line standard, or high-definition television standard; and

at least one output for transmitting the data to the first device associated with the second communications network.

**2**. The interface device of claim **1**, wherein the first and second formats comprise rich media.

**3**. The interface device of claim **2**, wherein the rich media comprises packetized information.

**4**. The interface device of claim **1**, wherein each of the data and the data translated to the second format is transmitted via coaxial, twisted-pair, fiber-optic, satellite, or over-the-air broadcast means.

**5**. The interface device of claim **1**, wherein the data is received at the at least one input from the first communications network via the second device.

**6**. The interface device of claim **5**, wherein the first communications network comprises a wireless network.

**7**. The interface device of claim **6**, wherein the data is received at the at least one input from the second device via a wireless connection.

**8**. The interface device of claim **6**, wherein the data is received at the at least one input from the second device via a wired connection.

**9**. The interface device of claim **5**, wherein the first communications network comprises a wired network.

**10**. The interface device of claim **9**, wherein the data is received at the at least one input from the second device via a wireless connection.

**11**. The interface device of claim **9**, wherein the data is received at the at least one input from the second device via a wired connection.

**12**. A method for providing communications between a first communications network and a first device associated with a second communications network via an interface device, comprising:

receiving data in a first format from the first communications network at at least one input of the interface device, wherein the interface device receives the data from the first communications network via a second device;

accessing a profile associated with the interface device to determine at least one of the second communications network for transmitting the data, the first device associated with the second communications network for transmitting the data, or translations to be performed on the data;

altering substance of the data at the interface device, wherein altering the substance of the data at the interface device includes improving a poor quality signal carrying the data based on known characteristics of the second device providing the signal carrying the data, adding a digital watermark to the data to identify at least one of the first communications network or a user sending the data, adding information to the data, and annotating the data;

identifying a second format compatible with the second communications network, wherein at least one of the first or second formats comprise one of a national television system committee standard, a phase alternating line standard, or high-definition television standard; and

translating the data to the second format compatible with the second communications network.

**13**. The method of claim **12**, further comprising transmitting the data translated to the second format to the first device associated with the second communications network via at least one output of the interface device.

**14**. The method of claim **12**, wherein the data is received at the at least one input from the second device via either a wireless connection or a wired connection.

**15**. A non-transitory computer-readable storage medium having computer-executable instructions stored thereon which, when executed by a computer, cause the computer to:

receive data in a first format from a first communications network at at least one input of an interface device, wherein the interface device receives the data from the first communications network via a first device;

access a profile associated with the interface device to determine at least one of a second communications network for transmitting the data, a second device associated with the second communications network for transmitting the data, or translations to be performed on the data;

alter substance of the data at the interface device, wherein altering the substance of the data at the interface device includes improving a poor quality signal carrying the data based on known characteristics of the first device providing the signal carrying the data, adding a digital watermark to the data to identify at least one of the first communications network or a user sending the data, adding information to the data, and annotating the data;

translate the data to a second format compatible with the second communications network, wherein at least one of the first or second formats comprise one of a national television system committee standard, a phase alternating line standard, or high-definition television standard; and

transmit the data translated to the second format to the second device associated with the second communications network via at least one output.

**16**. The non-transitory computer-readable storage medium of claim **15**, wherein the first communications network comprises a wired network.

**17**. The non-transitory computer-readable storage medium of claim **16**, wherein the data is received at the at least one input from the first device via a wireless connection.

**18**. The non-transitory computer-readable storage medium of claim **16**, wherein the data is received at at least one input from the first device via a wired connection.

**19**. The interface device of claim **1**, wherein altering the substance of the data also includes filtering the data to extract a portion of the data to be transmitted and degrading the data.

**20**. The method of claim **12**, wherein altering the substance of the data at the interface device also includes filtering the data to extract a portion of the data to be transmitted and degrading the data.

* * * * *