

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.
Petitioner

v.

CARUCEL INVESTMENTS L.P.
Patent Owner

Case IPR2019-01102
Patent 7,848,701

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 7,848,701**

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EXHIBIT LIST

<i>Exhibit</i>	<i>Description</i>
1001	U.S. Patent No. 7,848,701 B2 to Gavrilovich (“the ’701 patent”)
1002	Prosecution File History of U.S. Patent No. 7,848,701 (“’701 Prosecution History”)
1003	Declaration of Mr. Denning in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 7,848,701 (“Denning Dec.”)
1004	Mr. Denning’s Curriculum Vitae
1005	U.S. Patent No. 5,276,686 to Ito (“Ito”)
1006	U.S. Patent No. 5,504,786 to Gardner (“Gardner”)
1007	U.S. Patent No. 5,109,390 to Gilhousen et al. (“Gilhousen390”)
1008	U.S. Patent No. 4,001,692 to Fenwick et al. (“Fenwick”)
1009	U.S. Patent No. 5,559,865 to Gilhousen (“Gilhousen865”)
1010	George Calhoun, <i>Digital Cellular Radio</i> , Artech House, Inc., 1988 (“Calhoun”)
1011	W.R. Young, “Advanced Mobile Phone Service: Introduction, Background, and Objectives,” <i>The Bell System Technical Journal</i> , vol. 58, no. 1, Jan. 1979; pp. 1-14. (accessible at https://archive.org/details/bstj58-1-1) (“Young”)
1012	V.H. Mac Donald, “Advanced Mobile Phone Service: The Cellular Concept,” <i>The Bell System Technical Journal</i> , vol. 58, no. 1, Jan. 1979; pp. 15-41. (accessible at https://archive.org/details/bstj58-1-15) (“Donald”)
1013	John Scourias, “Overview of the Global System for Mobile Communications,” May 19, 1995. (“Scourias”)
1014	“Advanced Communications Project, Technology Reference Document,” VisiCom Laboratories Inc., September 1993. (“VisiCom”)
1015	<i>Law Enforcement News</i> , vol. V, no. 20, Nov. 26, 1979. (accessible at https://archive.org/details/lawenforcementne20john_1/page/n15) (“News”)

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<i>Exhibit</i>	<i>Description</i>
1016	Excerpts from <i>Mobile Radio Technology</i> , vol. 6, no. 8, August 1988 (accessible at https://archive.org/details/MRT08August1988?q=mobile+extender) (“Standard”)
1017	U.S. Patent No. 5,504,935 to Vercauteren (“Vercauteren”)
1018	A.S. Acampora and J. H. Winters, “System Applications for Wireless Indoor Communications,” <i>IEEE Communications magazine</i> , vol. 25, no. 5, August 1987; pp. 11-20. (“Acampora”)
1019	T. O. Mottl, “Dual-Polarized Channel Outages During Multipath Fading,” <i>The Bell System Technical Journal</i> , vol. 56, no. 5, May-June 1977; pp. 675-701. (accessible at https://archive.org/details/bstj56-5-675) (“Mottl”)
1020	Jack Salz, and Jack H. Winters, “Effect of Fading Correlation on Adaptive Arrays in Digital Mobile Radio,” <i>IEEE transactions on Vehicular Technology</i> , vol. 43, no. 4, Nov. 1994; pp. 1049-1057. (“Salz”)
1021	U.S. Patent No. 5,481,533 to Honig et al. (“Honig”)
1022	U.S. Patent No. 7,221,904 to Gavrilovich (“the ’904 patent”)
1023	Prosecution File History of U.S. Patent No. 7,221,904 (“’904 Prosecution History”)
1024	U.S. Patent No. 5,566,209 to Forssén et al. (“Forssén”)
1025	U.S. Patent No. 5,345,467 to Lomp et al. (“Lomp”)
1026	U.S. Patent No. 6,393,281 to Capone et al. (“Capone”)
1027	U.S. Patent No. 5,434,853 to Hemmady et al. (“Hemmady”)
1028	U.S. Patent No. 5,267,261 to Blakeney, II et al. (“Blakeney”)
1029	U.S. Patent No. 5,101,501 to Gilhousen et al. (“Gilhousen501”)
1030	U.S. Patent No. 4,539,706 to Mears et al. (“Mears”)
1031	U.S. Patent No. 5,509,028 to Marque-Pucheu (“Marque-Pucheu”)
1032	U.S. Patent No. 4,675,863 to Paneth et al. (“Paneth”)
1033	Excerpts from Webster’s New World Dictionary, 3 rd College Edition, Simon & Schuster, 1993. (“Webster”)

I. Introduction

Volkswagen Group of America, Inc. (“VWGoA”) petitions for *inter partes* review of claims 10, 15-18, 31 and 33-35 (“challenged claims”) of U.S. Patent No. 7,848,701 (“the ’701 patent”) assigned to Carucel Investments L.P. (“Carucel”), titled “Mobile Communication System With Moving Base Station.”

The challenged claims are directed to methods for wirelessly communicating with a portable device moving through a network. More specifically, the challenged claims recite a technique in which a fixed base station communicates with a portable device through a moving base station. The moving base station is preferably moving in the same direction as the portable device, and forwards the signals received from the fixed base station to the portable device. But before the ’701 patent was filed, the moving base stations recited in the challenged claims were well-known and had been fully developed. These developments were documented in various patents and industry publications prior to the earliest possible priority date of the ’701 patent. The challenged claims are therefore not patentable and should be canceled.

Petitioner’s expert, Mr. Scott Denning, who has over 20 years of experience working with wireless communications systems, explains that mobile base station communication techniques recited in the challenged claims were well-known and publicly disclosed by companies in the industry well before the filing of the ’701

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patent and prior to the earliest possible priority date for that patent. For example, between 1989 and 1994, well before the earliest possible priority date of the '701 patent, multiple patents were filed—some being assigned to Toshiba and other being assigned to Qualcomm—detailing specific systems and methods for facilitating wireless communications between a fixed base station and a mobile device through the use of a mobile base station.

One of these patents is U.S. Patent No. 5,276,686 to Ito (“Ito”). Ito specifically describes a mobile base unit disposed in an automobile that facilitates communication between a base station and an on-board wireless device. Another one of these patents is U.S. Patent No. 5,559,865 to Gilhousen (“Gilhousen865”). Like Ito, Gilhousen865 similarly discloses a repeater (a well-known device that operates substantially similarly to a mobile base station) disposed on an airplane that facilitates communication between a ground base station and an on-board wireless device. Additionally, U.S. Patent No. 5,504,786 to Gardner (“Gardner”) describes the benefits of employing spatially diverse antennas in a wireless receiver.

As such, a skilled artisan would have recognized that both Ito and Gilhousen865, in various combinations with other references discussed below, disclose the methods recited in the challenged claims of the '701 patent. Unfortunately, however, none of these references were before the examiner during

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prosecution. In fact, only six references were ever considered during prosecution of the '701 patent. And as explained below, if Ito or Gilhousen⁸⁶⁵ had been before the examiner during prosecution, the '701 patent should not have been allowed.

II. Mandatory Notices (37 C.F.R. § 42.8(a)(1))

REAL PARTY IN INTEREST: The real party-in-interest is Petitioner Volkswagen Group of America, Inc.

RELATED MATTERS: The '701 patent is the subject of the following civil actions: *Carucel Investments LP v. Fiat Chrysler Automobiles US LLC et al*, Case No. 3-18-cv-03331 (TXND), *Carucel Investments LP v. General Motors Company*, Case No. 3-18-cv-03332 (TXND), *Carucel Investments LP v. Volkswagen Group of America Inc.*, Case No. 3-18-cv-03333 (TXND), and *Carucel Investments LP v. Mercedes-Benz USA LLC et al.*, Case No. 3-18-cv-03334 (TXND), all filed on December 18, 2018.

The '701 patent is related to U.S. Patent No. 7,221,904 (the '904 patent), U.S. Patent No. 7,979,023 (the '023 patent), U.S. Patent No. 8,463,177 (the '177 patent), and U.S. Patent No. 8,718,543 (the '543 patent), all of which are part of the aforementioned civil actions. Additionally, each of these patents is the subject of *inter partes* review petitions filed concurrently herewith.

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LEAD AND BACKUP COUNSEL: Under 37 C.F.R. § 42.8(b)(3) and 42.10(a),
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III. Grounds for Standing (37 C.F.R. § 42.104(a))

The undersigned and Petitioner certify that the '701 patent is available for
inter partes review. Petitioner is not barred or estopped from requesting this *inter
partes* review on the grounds herein.

IV. Identification of Challenge (37 C.F.R. § 42.104(b))

A. Citation of Prior Art

The '701 patent was filed on October 20, 2010, and claims priority to
multiple earlier applications. Specifically, the '701 patent is a continuation of
application no. 09/401,584, filed September 22, 1999 (now U.S. Patent No.
7,221,904), which is a continuation of application no. 08/953,962, filed October
20, 1997 (now U.S. Patent No. 6,026,277), which is a continuation of application

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no. 08/687,722, filed July 26, 1996 (now U.S. Patent No. 5,729,826), which was a national phase of PCT/US1995/07037, filed June 2, 1995. Thus, the earliest effective priority date of the '701 patent is June 2, 1995. VWGoA does not concede that the challenged claims of the '701 patent are entitled to the benefit of this date. Nonetheless, all references relied upon in this Petition qualify as prior art with respect to the June 2, 1995 priority date.

U.S. Patent No. 5,276,686 to Ito¹ (Ex. 1005), titled “Mobile Radio Communication System Having Mobile Base and Portable Devices as a Mobile Station,” was filed on October 17, 1991 and issued on January 4, 1994, more than one year prior to the earliest effective filing date of the '701 patent. Therefore, Ito is prior art at least under 35 U.S.C. § 102(b) (pre-AIA).

¹ VWGoA acknowledges that Ito and references similar to Gilhousen390 and Gilhousen865 were also previously identified in *Carucel Investments v. Novatel Wireless, Inc.*, No. 3:16-cv-00118 Dkt. Nos. 138, 139 (S.D. Cal. 2016). However, Ito, Gilhousen390, and Gilhousen865 are applied differently, and in different combinations, herein. Also, because Gardner was not involved in this prior litigation, the Board should institute *inter partes* review of the challenged claims on the basis of the grounds presented herein.

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U.S. Patent No. 5,504,786 to Gardner (Ex. 1006), titled “Open Loop Phase Estimation Methods and Apparatus for Coherent Combining of Signals Using Spatially Diverse Antennas in Mobile Channels,” was filed on October 5, 1993, more than one year prior to the earliest effective filing date of the ’701 patent. Therefore, Gardner is prior art at least under 35 U.S.C. § 102(e) (pre-AIA).

U.S. Patent No. 5,109,390 to Gilhousen et al. (Ex. 1007), titled “Diversity Receiver in a CDMA Cellular Telephone System” (“Gilhousen390”), was filed on November 7, 1989 and issued on April 28, 1992, more than three years prior to the earliest effective filing date of the ’701 patent. Therefore, Gilhousen390 is prior art at least under 35 U.S.C. § 102(b) (pre-AIA).

U.S. Patent No. 5,559,865 to Gilhousen (Ex. 1009), titled “Airborne Radiotelephone Communications System” (“Gilhousen865”), was filed on July 8, 1994, more than 10 months prior to the earliest effective filing date of the ’701 patent. Therefore, Gilhousen865 is prior art at least under 35 U.S.C. § 102(e) (pre-AIA).

B. Statutory Grounds for the Challenge

Ground	References	Basis	Claims Challenged
1	Ito + Gardner	103	10, 15-18, 31, 33-35
2	Gilhousen865 + Gilhousen390	103	10, 15-18, 31, 33-35

V. Technical Background

The '701 patent is directed to a movable base station for facilitating communications between mobile telephones and fixed base stations. *See* '701 patent, Ex. 1001, 2:65-3:14. But these techniques, and the benefits thereof, were known well before the '701 patent's earliest possible priority date.

A. Communications between mobile telephones and fixed base stations were well-known

As an initial matter, Mr. Denning explains in his declaration (with the aid of numerous supporting references) that systems and methods for communicating between mobile telephones and fixed base stations were well-known prior to the '701 patent. Denning Dec., Ex. 1003, ¶¶ 41-44. In fact, the background section of the '701 patent admits that mobile units communicate with a “nearest cell site” (e.g., base station). Ex. 1001, 1:27-28. This understanding was reinforced by numerous publications from the relevant time period prior to the earliest possible priority date of the '701 patent, including Young, Vercautren, and Forssén. Ex. 1003, ¶ 45.

B. Handoffs were well-known

Mr. Denning also explains in his declaration (again with the aid of numerous supporting references) that performing a handoff procedure when a mobile telephone moves from one fixed base station coverage area and toward another was well-known prior to the earliest possible priority date of the '701 patent. Ex.

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1003, ¶ 46. This is also acknowledged in the background section of the '701 patent which states that, “[o]ne of the functions to be performed by the telephone network interface is the so-called ‘handoff’ function.” Ex. 1001, 1:35-37. According to the '701 patent, this procedure occurs as a natural result of the mobile device moving through the network coverage area. *Id.*, 1:37-39. This understanding was again reinforced by numerous publications from the relevant time period prior to the earliest possible priority date of the '701 patent, including Lomp, Hemmady, and Capone. Ex. 1003, ¶¶ 47-53.

Further, during a “soft handoff,” “***two or more base stations or sectors of a base station transmit concurrently*** to the mobile station.” Blakeney, 3:3-5. In this manner, the communication is “uninterrupted by the eventual handoff from the base station corresponding to [the cell] from which the mobile station is exiting to the base station corresponding to [the] cell from which the mobile station is entering.” Blakeney, 2:65-68. The fact that handoffs and soft handoffs, and the concepts behind this procedure, were well-known is again reinforced by numerous publications from the relevant time period prior to the earliest possible priority date of the '701 patent, including Gilhousen⁸⁶⁵, Gilhousen³⁹⁰, Vercauteren, and Forssén. Ex. 1003, ¶¶ 54-64.

C. Moving base station were well-known

As was the case with the aforementioned communications between mobile telephones and fixed base stations and the use of handoffs to facilitate those communications, the concept of moving base stations were also well-known. For example, Mr. Denning explains in his declaration (again with the aid of numerous supporting references) that the idea of implementing a moving base station between a mobile telephone and fixed base stations to perform the handoff function and to facilitate continuous communication was a well understood technique prior to the earliest possible priority date of the '701 patent. *See, e.g.*, Marque-Pucheu, Abstract (“At least one repeater station is used to receive radio signals transmitted by the base station and to retransmit radio signals to the mobile stations over the same frequency band”). This understanding was again reinforced by numerous publications from the relevant time period prior to the earliest possible priority date of the '701 patent, including News, Marque-Pucheu, and Vercautren. Ex. 1003, ¶¶ 65-77.

D. The multipath fading problem and prior art solutions were well-known.

Mr. Denning also explains in his declaration (again with the aid of numerous supporting references) that fading and corresponding solutions were well-known prior to the earliest possible priority date of the '701 patent. Ex. 1003, ¶ 78. Fading may be due to free space loss as well as multipath propagation. Ex. 1003, ¶¶ 79-80.

This effect causes a destruction of received signals by diminishing the strength of the received signal, especially in fast moving vehicles such as automobiles. Ex. 1003, ¶ 81. Mr. Denning also explains (again with the aid of numerous supporting references), however, that it was well-known to use multiple antennas to create spatial diversity to combat against fading. Ex. 1003, ¶ 82. This understanding was again reinforced by numerous publications from the relevant time period prior to the earliest possible priority date of the '701 patent, including Calhoun, Gilhousen865, Gilhousen390, Vercauteren, and Forssén. Ex. 1003, ¶¶ 83-85.

VI. The '701 Patent

A. Overview

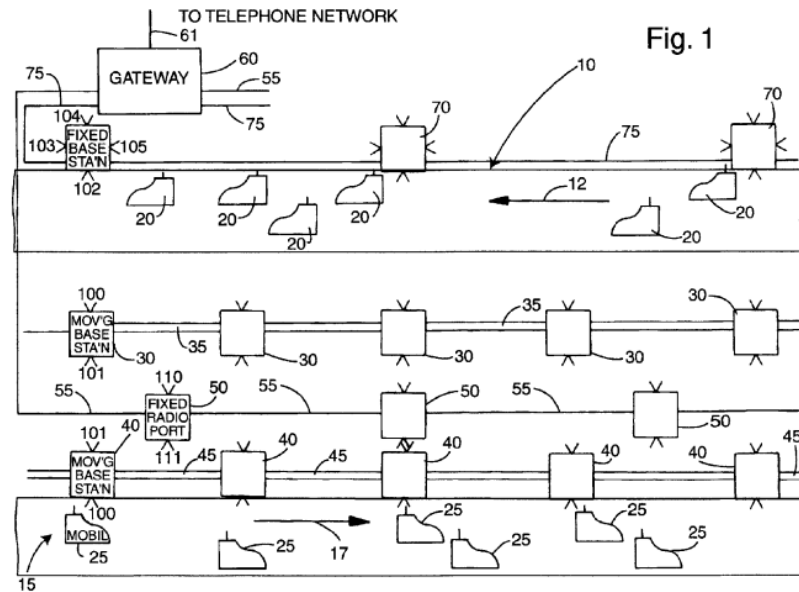
Like the prior art techniques discussed above, the '701 patent generally relates to a mobile communication system that includes a moving base station configured to communicate with fixed radio ports. Ex. 1001, Abstract. In particular, the '701 patent describes the “moving base station” being “interposed between a moving mobile telephone unit and a fixed base station” and facilitating communication between the two systems. Ex. 1001, 2:65-3:1.

According to the '701 patent, “[a] problem with existing mobile telephone systems is the considerable time required in handoffs.” Ex. 1001, 1:54-55. A “handoff” refers to a procedure occurring when a mobile unit moves “away from one cell site and toward another cell site.” Ex. 1001, 1:38-39. Based on the signal

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quality, a call that is in progress may be transferred from one cell site to another as the mobile unit moves to the next cell site. *See* Ex. 1001, 1:39-43. Part of the handoff process includes “sending a message to the mobile unit transmitter/receiver to tune from its present voice channel to a voice channel in the new cell site...” Ex. 1001, 1:45-47. As previously described, the ’701 patent alleges that the amount of time required to perform a handoff is lengthy and undesirable. *See* Ex. 1001, 1:54-55.

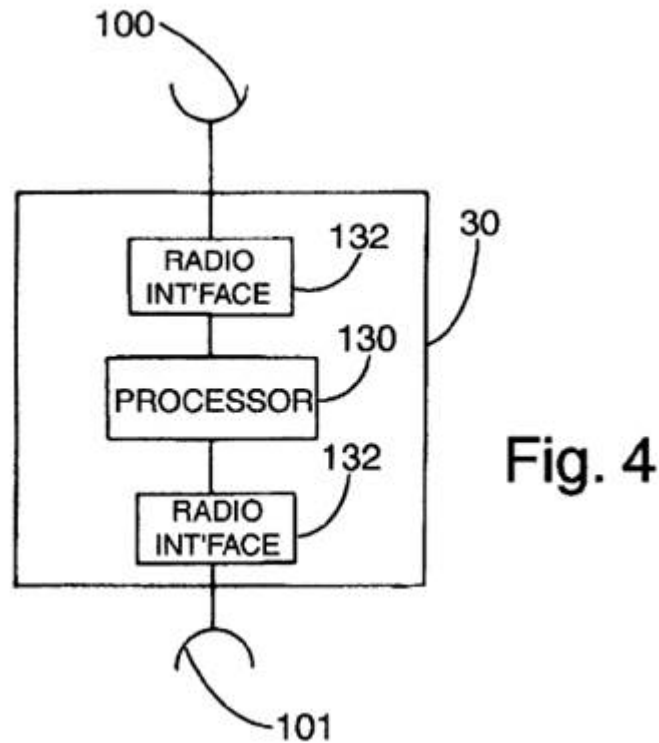
The ’701 patent purports to solve the alleged handoff problem using a “moving base station.” *See* Ex. 1001, 5:8-16. The moving base station performs the handoff function, and “[a]dvantageously, because [] movement of the base station [is] in the same direction as the traveling mobile unit, the number of handoffs is greatly reduced.” Ex. 1001, 5:13-16. That is, the mobile unit is able to maintain communication with the moving base station while the mobile unit is moving, reducing the number of handoffs occurring at the mobile unit. *See* Ex. 1001, 5:8-16. The moving base station is interposed between a moving mobile telephone unit and fixed base stations and performs the handoff function to facilitate communication between the systems. *See* Ex. 1001, 2:65-3:1. The claims are directed to the functionality and circuitry of the moving base station.



The moving base station is configured to move as a vehicle: “The moving base stations 30 may be moved by means of a rail 35, or other suitable conveying device which may include an automotive vehicle traveling on the roadway, in the same direction as the traffic flow on the roadway 10...” Ex. 1001, 4:5-9. “In accordance with this invention, a movable base station moves with the traffic at a rate of speed which is comparable to the speed of the traffic and communicates with a moving mobile telephone unit via standard mobile radio transmission.” Ex. 1001, 3:1-5.

To facilitate communications, the circuitry of the moving base station uses conventional hardware components: “FIG. 4 is a block diagram representation of a moving base station...” Ex. 1001, 3:50-51. “Each of the moving base stations 30, 40 is provided with antennas 100, 101.” Ex. 1001, 5:17-18. “The antennas 100 on

the base stations 30, 40 are used to communicate with the mobile units 20, 25
whereas the antennas 101 on the moving base stations 30, 40 are used to
communicate with the fixed radio ports 50.” Ex. 1001, 5:22-26.



“As the moving base stations 30, 40 move relative to the fixed radio ports 50, data representing voice signals and call related information is transmitted between the antennas 101 on the moving base stations 30, 40 and the antennas [] on the fixed radio ports 50.” Ex. 1001, 5:36-41. In this manner the moving base stations may facilitate communications from a fixed radio port to a mobile unit using antennas 100 and 101. *See* Ex. 1001, 5:22-26. To process communications between fixed radio ports and mobile devices, the moving base station uses processor and radio interface circuits—“processor 130 may be a standard

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microprocessor and the radio interface circuits 132 may be standard radio interface circuits.” Ex. 1001, 6:26-28. The radio interface circuits 132 “are well known and commercially available circuits.” *See* Ex. 1001, 6:36-39. Despite the use of these well-known components, the ’701 patent claims are directed to the circuitry and functionality of the moving base station.

As discussed in Sections V.A-D above, the ’701 patent does not purport to invent either wireless communications between a mobile device and a base station or performing handoffs. Instead, the ’701 patent merely purports to add a technique whereby an intermediary (e.g., mobile base station) moves relative to the base station and facilitates the communication between the base station and the mobile device to these known systems and methods for facilitating communications between mobile telephones and fixed base stations. This lone point of purported novelty is also confirmed by the prosecution history in related U.S. Patent No. 7,221,904. *See* ’904 Prosecution History, Ex. 1023, 182 (“The exemplary embodiments of the invention, however, overcome this problem [of the identified prior art] by providing a [mobile base station with] relatively smaller communication cell that tracks the expected motion of the mobile unit.”)

B. Prosecution History Summary

The ’701 patent was filed on April 9, 2007. Prosecution History, Ex. 1002, 0001. A first Office Action was issued on January 10, 2008. *Id.*, 0067. The Office

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Action rejected 14 of the 20 claims, and identified 6 claims as containing allowable subject matter. *Id.*, 0068. Specifically, claims 1, 2, 4-6, 9-11, 12, 14-16, 19 and 20 were rejected over U.S. Patent No. 4,539,706 to Mears. On May 25, 2008, Patent Owner filed an amendment in reply to the Office Action that amended independent claim 11 (patented claim 10) to include subject matter from a dependent claim that was identified as allowable. Namely, claim 11 was amended to recite “a controller configured to align and combine the received fixed port signals.” As discussed herein, this limitation was well-known in the art at the time of the ’701 patent. In the same amendment, Patent Owner also added 24 new claims. *Id.*, 0082-0085.

On August 22, 2008, the Patent Office issued a subsequent Office Action allowing all original claims and some of the added claims, but rejecting others of the added claims over Mears. *Id.*, 0095-0097. In a reply filed September 1, 2008, Patent Owner amended the rejected claims to recite “a plurality of spatially separated antennas configured as a plurality of phased array antennas to provide directional radio frequency beams.” *Id.*, 0103-0110. This limitation is not recited in any of the challenged claims.

Subsequently, the Patent Office issued another rejection rejecting all claims over U.S. Patent No. 5,404,570 to Charas et al. (“Charas”). On July 1, 2009, Patent Owner filed a reply in which no changes were made to the challenged claims (e.g., claims 11 and 33). Instead, Patent Owner argued that the combination of Charas

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and U.S. Patent No. 5,260,968 to Gardner was improper. *Id.*, 133. The Patent Office maintained the rejection in a Final Office Action issued on October 29, 2009. *Id.*, 143-149.

Patent Owner filed a Pre-Appeal brief on February 27, 2010. *Id.*, 154. The pre-appeal conference panel maintained the rejections of the Examiner. *Id.*, 167. Patent Owner filed an Appeal Brief on June 27, 2010 repeating the combinability arguments presented in the July 1, 2009 reply. *Id.*, 185. Thereafter, rather than file an Examiner's Answer to the Appeal Brief, the Examiner withdrew the rejection and allowed the application in a Notice of Allowance issued on October 29, 2009.

As explained in Petitioner's grounds below, the claimed concepts existed well before the earliest possible priority date of the '701 patent. Indeed, had any of the aforementioned references been before the examiner during prosecution, the '701 patent should not have been allowed.

C. Level of Ordinary Skill in the Art

A person of ordinary skill in the art ("POSITA") at the time of the claimed invention would have had a B.S. degree in Computer Science, Electrical Engineering, or an equivalent field, as well as at least 2–3 years of academic or industry experience in mobile wireless communications, or comparable industry experience. Ex. 1003, ¶¶ 29-30.

D. Claim Construction

In an *inter partes* review, claims are “construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). If trial is instituted, all claim terms must be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the alleged invention in light of the specification and the prosecution history pertaining to the patent. *Id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-1313 (Fed. Cir. 2015) (en banc); *see also* 83 Fed. Reg. 51340.

The '701 patent does not explicitly define any claim terms, and the claim terms recited in the challenged claims are sufficiently clear on their face. Thus, none of these terms require explicit constructions.² Accordingly, all claim terms

² If Carucel argues (or the Board adopts) that claim constructions from *Carucel Investments v. Novatel Wireless, Inc.* should apply, such arguments would not substantively impact the analysis or conclusions herein. As discussed, the identified references disclose every claim limitation even under the alternative constructions proposed in this prior litigation.

should receive their plain and ordinary meaning, in the context of the '701 patent specification, under the *Phillips* standard.³

VII. Overview of the Applied References

A. U.S. Patent No. 5,276,686 (Ito)

Ito, like the '701 patent, is directed to “a radio communication system to be used as an automobile telephone system.” Ito, Ex. 1005, 1:9-10. Ito describes that prior automobile communication systems included a mobile station that wirelessly communicated with fixed base stations. *See id.*, 1:16-27. However, in this configuration, the mobile station and the telephone were not wirelessly connected, but rather connected via a “signal cord.” *Id.*, 1:51-53. As a result, in addition to other limitations imposed by the corded connection, the curled cord was “an annoying obstacle when the driver drives and speaks into the telephone transmitter simultaneously.” *Id.*, 1:55-57; *see also id.*, 1:58-2:2.

Therefore, Ito discloses a mobile radio communication system for an automobile “that wirelessly connects not only between a base station and a mobile station but also between a mobile station, or a mobile base device, and a portable

³ VWGoA’s assertion that no terms need to be construed for the purpose of this proceeding is not an admission that the challenged claims are valid under 35 U.S.C. § 112. VWGoA reserves the right to challenge the validity of the claims under 35 U.S.C. § 112 in other proceedings and forums.

device by a radio channel.” *Id.*, 2:5-10. According to Ito, this “eliminate[s] the necessity of wiring the mobile base device and portable device and enhance[s] the maneuverability of an automobile telephone handset.” *Id.*, 2:10-12.

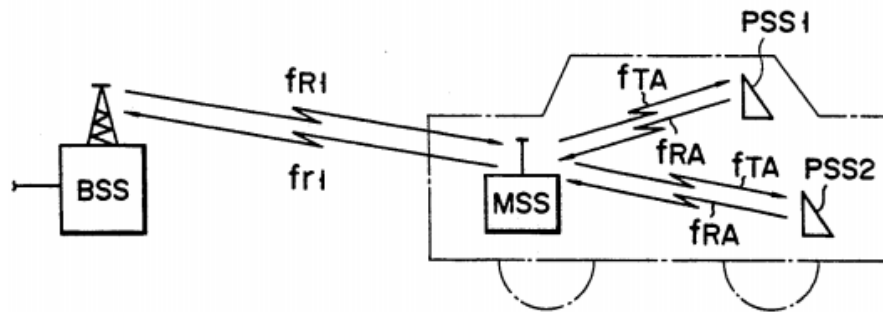


FIG. 6

The configuration of Ito’s communication system is shown in Fig. 6, above.⁴ As shown in that figure, an automobile is equipped with a mobile base device MSS. *Id.*, 12:52. Meanwhile, users inside the vehicle use telephones (portable devices PSS) that wirelessly communicate with the mobile base device. For example, as shown in Fig. 6, the mobile base device MSS communicates with a

⁴ Although Fig. 6 depicts a “second embodiment” of Ito, that embodiment merely facilitates the use of multiple portable devices inside the vehicle, as opposed to a single portable device described in the first embodiment. Fig. 6, otherwise, is merely a magnified version of vehicle MS2 depicted in Fig. 1, and is relied upon merely for ease of reference.

fixed base station BSS via frequencies $fR1$ and $fT1$ ⁵, and communicates with one or more portable devices PSS1 and PSS2 via frequencies fRA and fTA . Ito illustrates the configuration of the mobile base device in further detail in Fig. 3.

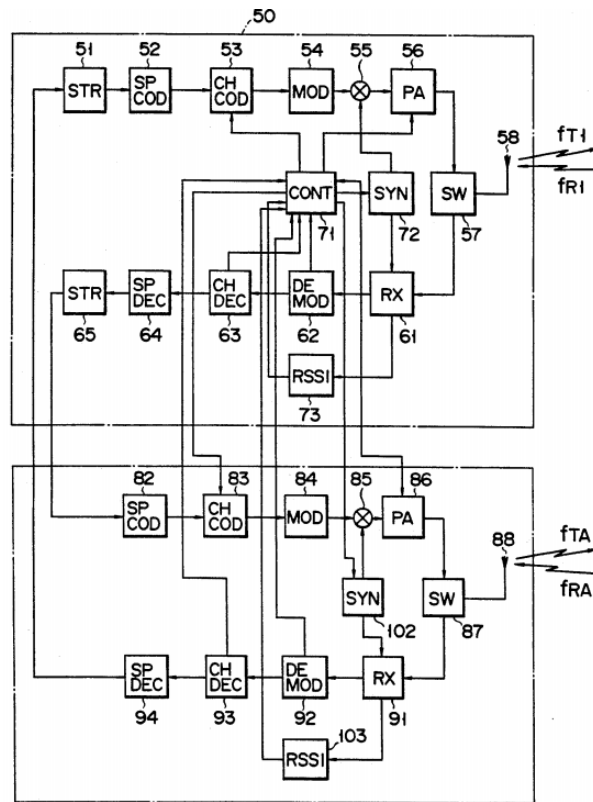


FIG. 3

As shown in Ito's Fig. 3, the mobile base device MSS includes a first transmitter-receiver unit 50 and a second transmitter-receiver unit 80. *Id.*, 7:9-12. Whereas the first transmitter-receiver 50 facilitates communication with the base station BSS, the second transmitter-receiver 80 facilitates communication with the

⁵ Although Fig. 6 shows the frequency as $fR1$, Ito's specification clarifies that this is actually frequency $fT1$. *See* Ex. 1005, 12:50-63.

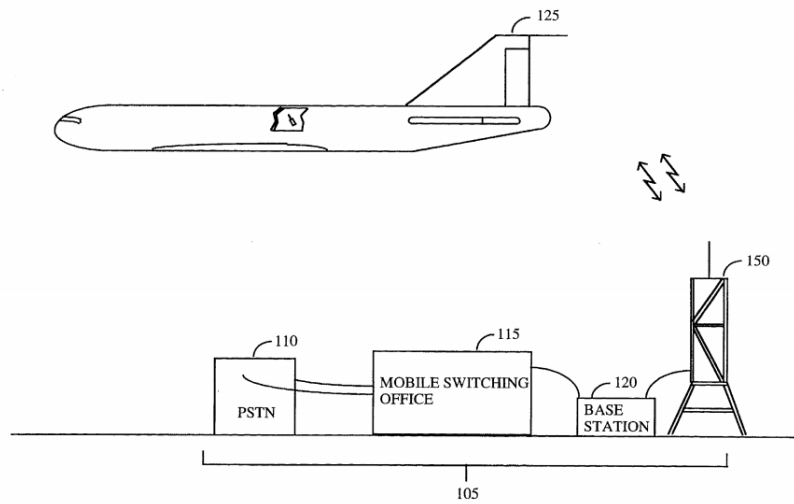
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portable devices PSS. *Id.*, 7:12-20. Thus, in operation, the mobile base device MSS receives signals from the base station BSS via the first transmitter-receiver 50 and forwards those signals to the portable device PSS2 via the second transmitter-receiver 80. *Id.*, 13:15-18. Similarly, the second transmitter receiver receives signals from the portable device PSS and forwards them to the base station BSS via the first transmitter-receiver 50. *Id.*, 7:25-28, 7:51-54. In this manner, the mobile base device MSS provides a moving source of communications connectivity for portable devices located within a moving vehicle. Ex. 1003, ¶ 95.

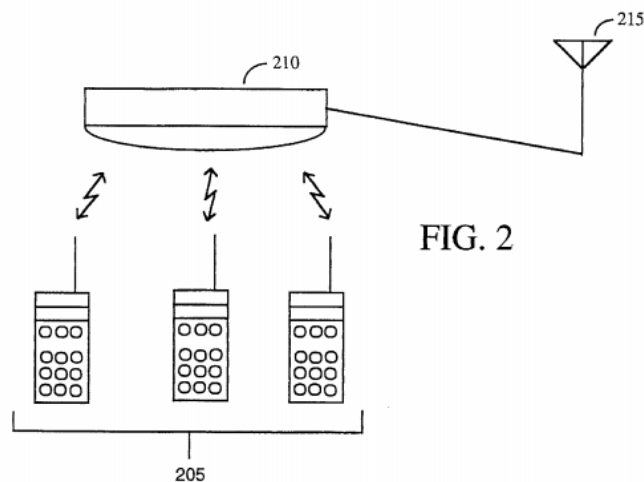
B. U.S. Patent No. 5,559,865 (Gilhousen865)

Gilhousen865, like the '701 patent, describes a system for providing communications between a ground base station and a mobile wireless telephone—in Gilhousen865's case, a wireless telephone located on an airplane. Gilhousen865, Ex. 1009, 1:7-10. Specifically, the system of Gilhousen865 comprises two subsystems: a ground based subsystem and an airborne based subsystem. *Id.*, 2:9-12.

FIG. 1



The ground subsystem includes a base station 120 coupled to the public switched telephone network (PSTN) 110 via a switching center 115. The base station 120 wirelessly transmits signals to, and receives signals from, radiotelephones to provide communication between the radiotelephones and the network 110. *Id.*, 2:24-33. According to Gilhousen865, the base station “is coupled to an antenna (150) that receives and radiates the CDMA radiotelephone signals.” *Id.*, 2:32-33.



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The airborne subsystem, on the other hand, includes a repeater 210 installed in the airplane in which the wireless phone 205 is located. As shown in Fig. 2, the repeater includes an external antenna 215 that sends and receives signals with the base station. *See id.*, 2:53-65. According to Gilhousen⁸⁶⁵, the system can function both to provide outgoing calls from the radiotelephone to the ground base station, and incoming calls originating from the ground subsystem to the airborne radiotelephone. *See id.*, 2:53-63. In the incoming direction, the external antenna 215 receives the signals from the base station and provides them to the repeater 210, which then “communicates the signal to the proper radiotelephone (205) in the aircraft.” *Id.*, 2:64-65. When configured to receive incoming calls, the repeater is configured like a base station. *Id.*, 3:3-10.

C. U.S. Patent No. 5,504,786 (Gardner)

Gardner is directed to a receiver for use in cellular communications. Gardner, Ex. 1006, 1:10-12, 2:17-19. According to Gardner, it was well-known in the art that “[o]ne of the most useful techniques for improving receiver performance in the mobile (Rayleigh) channel is to use spatial diversity.” *Id.*, 1:15-17; *see also id.*, 1:28-32. This involves using “two (or more) antennas spaced far enough apart so that the characteristics of the fading encountered by the desired signal are independent for each of the two receiver paths.” *Id.*, 1:17-20. However,

Gardner explains that the most difficult aspect of receiving spatially diverse signals is “determining how to align the phases” of those signals. *Id.*, 1:38-39.

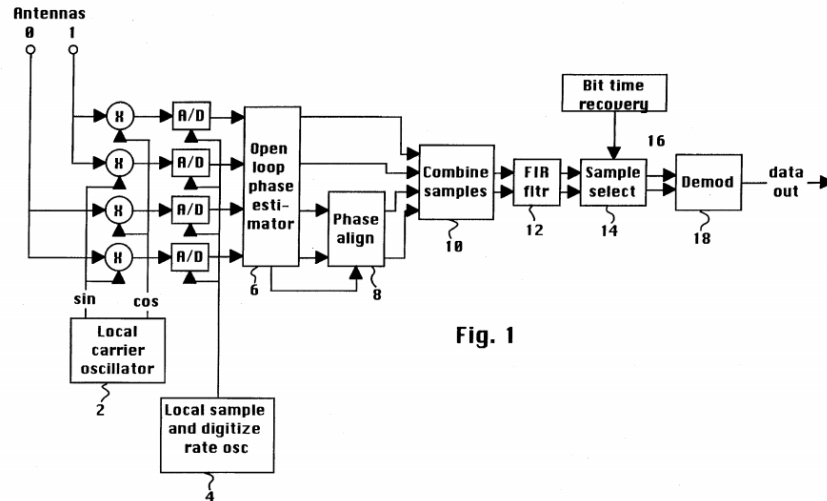


Fig. 1

Thus, Gardner describes a receiver configured to receive spatially diverse signals, and to properly align and combine the received signals. Gardner's exemplary receiver is illustrated in Fig. 1, above. As shown in Gardner's Fig. 1, the receiver includes two spatially diverse antennas 0 and 1. *Id.*, 2:23-24. After demodulation and conversion, the received signals are processed by Gardner's receiver for alignment and combining. *See id.*, 2:64-3:10. Specifically, after the signals are converted to digital, phase difference detection is performed in order to detect “a good estimate of the actual phase difference between the two signals.” *Id.*, 2:66-67. Then, the phase difference is used by Phase Align 8 to “phase align ...the two digitized signal vectors...by shifting the phase of the vector.” *Id.*, 3:1-7. Once aligned, the signals can be combined. *Id.*, 3:7-10.

D. U.S. Patent No. 5,109,390 (Gilhousen390)

Gilhousen390 is directed to “a novel and improved receiver design for enhancing the reliability and communications in the cellular telephone environment.” Gilhousen390, Ex. 1007, 1:7-12. Gilhousen390 explains that, in a cellular communication environment, transmitted signals are reflected by environmental surfaces. *Id.*, 3:1-6. These reflections result in the received signal consisting of multiple components, at least some of which have undergone fading. *Id.*, 2:54-68.

In order to compensate for fading in the received signal, Gilhousen390 discloses a variety of “diversity” configurations. *See, e.g., id.*, 5:22-34. One such diversity configuration is “cell-site diversity”: “The present invention further permits what is referred to herein as the cell-site diversity mode at times other than a handoff.” *Id.*, 7:55-57. In this mode, a call can be routed to a mobile device “through multiple cell-sites.” *Id.*, 11:58-59. Specifically, the mobile device is configured with at least two receivers that “are used as a two channel diversity receiver.” *Id.*, 7:66-68. The two receivers are then “assigned to demodulate the signals on the strongest two paths of the paths available from the original cell-site and from the new cell-site.” *Id.*, 8:13-15. According to Gilhousen390, this diversity configuration results in “a greatly improved resistance to deleterious fading that may occur in the multipath cellular telephone environment.” *Id.*, 8:18-21.

VIII. Grounds of Rejection

Claims 10, 15-18, 31 and 33-35 are unpatentable for at least the reasons set forth below. Ex. 1003, ¶¶105-200.

A. Ground 1: Claims 10, 15-18, 31 and 33-35 are obvious over Ito in view of Gardner.

1. A POSITA would have been motivated to combine Ito and Gardner

As discussed above, Ito is directed to a radio communication system for use in an automobile. Ex. 1005, 1:9-10. As part of that communication system, Ito discloses a mobile base device MSS that facilitates communication between the base station BSS and the portable device PSS. However, as shown in Ito's Fig. 3, first receiver-transmitter 50 (base station side) and second receiver-transmitter 80 (portable device side) each include only a single antenna. Thus, neither receiver-transmitter is configured to receive spatially diverse signals.

Ito also discloses that signals transmitted to a moving device often have higher error rates due to "high speed fading phenomena." *Id.*, 16:49-61. However, Ito does not specifically describe how such errors can be reduced. Ex. 1003, ¶106. Therefore, a POSITA would have looked to the prior art, such as Gardner, for determining how to combat the deleterious effects of fading on signals transmitted to a moving device. Ex. 1003, ¶106.

Like Ito, Gardner discloses a receiver for use in a wireless communication system. However, Gardner emphasizes the importance of employing spatially

diverse antennas in the receiver to reduce the effects of fading on received signals.

See Ex. 1006, 1:15-24. Specifically, Gardner discloses that “[o]ne of the most useful techniques for improving receiver performance...is to use spatial diversity.”

Id., 1:15-17. According to Gardner, spatial diversity reduces the effect of fading encountered by the received signal and provides “[c]onsiderable performance improvement.” *Id.*, 1:19-23.

Based on the teachings of Gardner, a POSITA would have been motivated to modify Ito so as to incorporate spatially diverse antennas. Ex. 1003, ¶ 108. Gardner describes its receiver in generic terms, and out of the context of any particular application. Thus, a POSITA would have recognized Gardner’s spatially diverse receiver to be modular. Ex. 1003, ¶ 108. Meanwhile, as shown in Fig. 3 of Ito, both the first receiver-transmitter 50 and the second receiver-transmitter 80 include single antennas that provide both transmission and reception functionality by way of a switch. Thus, modifying Ito with Gardner would have required minimal modifications. Namely, in place of the antenna 58 connected to the switch in Ito, at least one antenna would be provided for transmission and at least two antennas for reception. Ex. 1003, ¶ 108. The switch would then not only switch between the transmission-side circuitry (e.g. elements 51-56) and the receive-side circuitry (e.g., elements 61-65), but also between the transmission antenna and the receive antennas, respectively. Ex. 1003, ¶ 108. Finally, in order to achieve all the benefits

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of Gardner’s receiver, the receive-side circuitry (e.g., elements 61-65) would be modified to match the receiver circuitry illustrated in Gardner.

Although the modification has been described with respect to the first receiver-transmitter 50, it would have been apparent to a POSITA that the second receiver-transmitter 80 of Ito could likewise be modified. Ex. 1003, ¶ 109.

In addition to the motivations described above, a POSITA would have been further motivated to combine Ito and Gardner because both are in the same general field of mobile communications, and address the same problem—improving the performance of wireless communication systems. Ex. 1003, ¶ 110. Further, as evident from the above discussion, a POSITA could have combined the system of Ito with the teachings of Gardner by known methods, and the results of the combination would have been predictable to a POSITA (e.g., by replacing Ito’s antenna with Gardner’s spatially separated antennas). Ex. 1003, ¶ 110. Finally, the proposed combination of Ito and Gardner would involve nothing more than incorporating a well-known concept (i.e., Gardner’s signal diversity) into a well-known system (i.e., Ito’s radio communication system). Ex. 1003, ¶ 110; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398 at 419-421 (“[I]n many cases a person of ordinary skill [in the art] will be able to fit the teachings of multiple patents together like pieces of a puzzle.”)

2. Ito in view of Gardner renders obvious claim 10.

(a) Ito in view of Gardner discloses “[a] movable base station configured to move relative to Earth, the movable base station comprising.”⁶ [10P]

As shown in Fig. 6 of Ito, an automobile is equipped with a mobile base device MSS (*movable base station*). Ex. 1005, 12:52-53. The mobile base device MSS communicates with a fixed base station BSS, and communicates with one or more portable devices PSS within the automobile. In this manner, the mobile base device MSS facilitates communication between the portable device PSS and the base station BSS. Because the mobile base device MSS is located in an automobile, it would have been obvious to a POSITA that the mobile base device MSS is “*configured to move relative to Earth*.” Ex. 1003, ¶ 113.

(b) Ito in view of Gardner discloses “a plurality of spatially separated antennas.” [10A]

As shown in Ito’s Fig. 1 (annotated below), the mobile base device MSS (*movable base station*) facilitates communication between a stationary base station BSS2 and a portable device PSS located within the vehicle. *See* Ex. 1005, 5:62-65. As shown in Ito’s Fig. 3, the mobile base device MSS includes a first transmitter-

⁶ In the event that the preambles of the challenged independent claims are deemed limiting, which Petitioner does not concede, Petitioner has demonstrated the obviousness of those limitations in all Grounds.

receiver 50 “used for radio communication with the base station BSS,” and includes a second transmitter-receiver 80 “used for radio communication with its portable device PSS.” Ex. 1005, 7:12-16.

Ito does not explicitly disclose that first transmitter-receiver 50 includes “*a plurality of spatially separated antennas*.” However, Gardner discloses this limitation. Specifically, Gardner discloses a modular receiver for use in cellular communications, like that of Ito. Ex. 1006, 1:10-12. Gardner explains that “[o]ne of the most useful techniques for improving receiver performance in the mobile (Rayleigh) channel is to use spatial diversity.” *Id.*, 1:15-17. Gardner further explains that spatial diversity is achieved by “us[ing] two (or more) antennas spaced far enough apart” so as to reduce the effects of fading on the received signal. *Id.*, 1:15-20. Gardner explains that, during operation, multiple “RF signals [are] received on the two antennas” in order to improve receiver performance and combat fading issues. *Id.*, 2:24-30; 1:15-24. Gardner illustrates this configuration in Fig. 1, where “two spatially diverse antennas 0 and 1 are used.” *Id.*, 2:23-24. Therefore, Gardner discloses “*a plurality of spatially separated antennas*.”

As discussed above, a POSITA would have been motivated to employ Gardner’s spatially diverse antennas in the first transmitter-receiver 50 of Ito, at least for the reasons of reducing the effects of fading in the received signals. Ex. 1003, ¶ 116. When combined, the antenna 58 of Ito’s first transmitter-receiver 50

would be replaced with Gardner's spatially diverse antennas. Ex. 1003, ¶ 116. This would have resulted in Ito's mobile base unit MSS having "*a plurality of spatially separated antennas.*"

(c) Ito in view of Gardner discloses the "a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas." [10B]

Ito discloses a wireless communication environment for providing communication capabilities to a portable device PSS located within a moving vehicle. Ex. 1005, 1:8-13, Fig. 1. In order to achieve this objective, Ito describes outfitting the vehicle with a mobile base device MSS (*movable base station*). *Id.* As shown in Ito's Fig. 1 (annotated below), the mobile base device MSS facilitates communication between a stationary base station BSS2 (*fixed port*) and a portable device PSS located within the vehicle. *See id.*, 5:62-65.

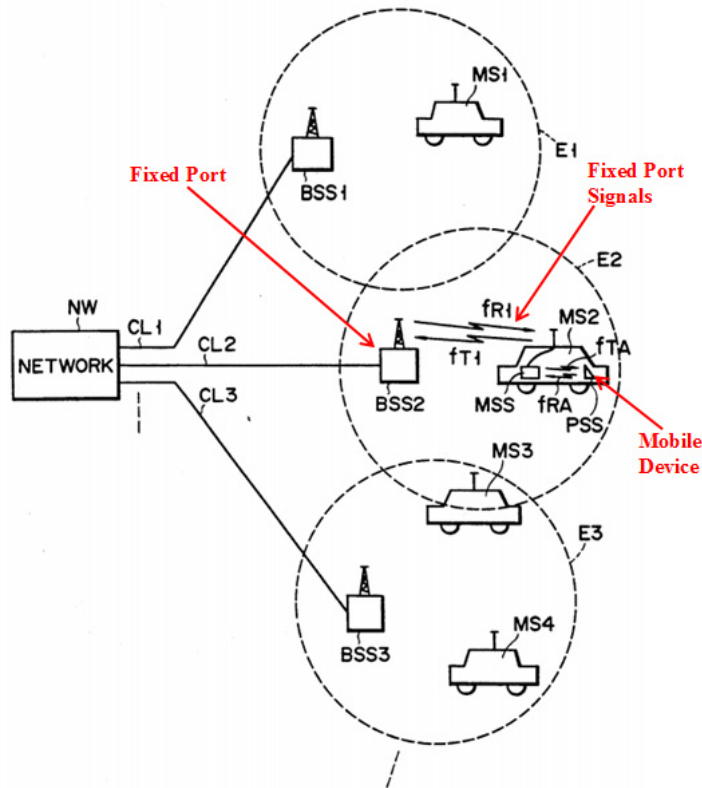


FIG. 1

As shown in Ito's Fig. 3, the mobile base device MSS includes a first transmitter-receiver 50 (*receiver*) "used for radio communication with the base station BSS," and includes a second transmitter-receiver 80 "used for radio communication with its portable device PSS." Ex. 1005, 7:12-16. The MSS thus "receive[s] a signal from the base station BSS2" (*receive [a] fixed port signal[] from a fixed port*) via the first transmitter-receiver 50 and "forward[s] it to the portable device PSS2" via the second transmitter-receiver 80. *Id.*, 13:15-18.

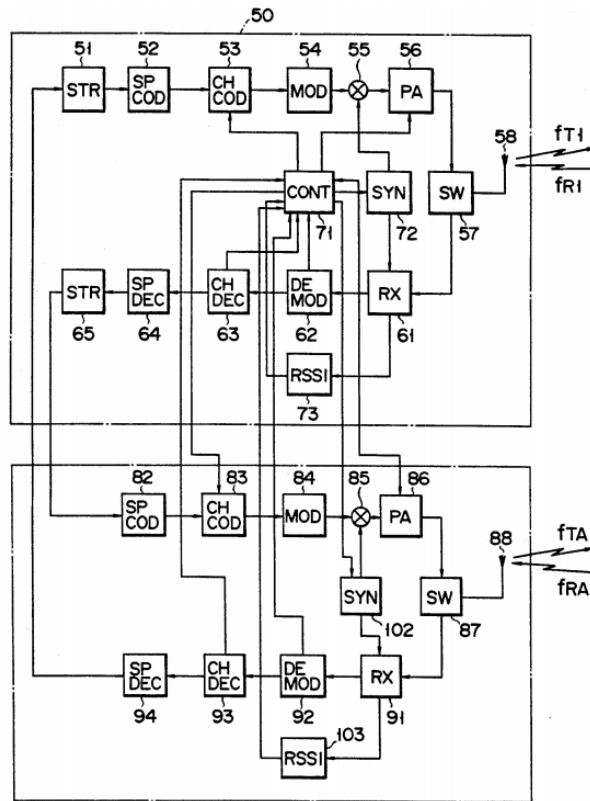


FIG. 3

Ito does not explicitly disclose that first transmitter-receiver 50 includes “*spatially separated antennas*” for receiving multiple “*fixed port signals*.” However, Gardner discloses this limitation. Specifically, Gardner discloses a modular receiver for use in cellular communications, like that of Ito. Ex. 1006, 1:10-12. Gardner explains that “[o]ne of the most useful techniques for improving receiver performance in the mobile (Rayleigh) channel is to use spatial diversity.” *Id.*, 1:15-17. Gardner further explains that spatial diversity is achieved by “us[ing] two (or more) antennas spaced far enough apart” so as to reduce the effects of fading on the received signal. *Id.*, 1:15-20. Gardner explains that, during operation,

multiple “RF signals [are] received on the two antennas” in order to improve receiver performance and combat fading issues. *Id.*, 2:24-30; 1:15-24. Gardner illustrates this configuration in Fig. 1, where “two spatially diverse antennas 0 and 1 are used.” *Id.*, 2:23-24. Therefore, Gardner discloses “*receiv[ing] fixed port signals ... through the plurality of spatially separated antennas.*”

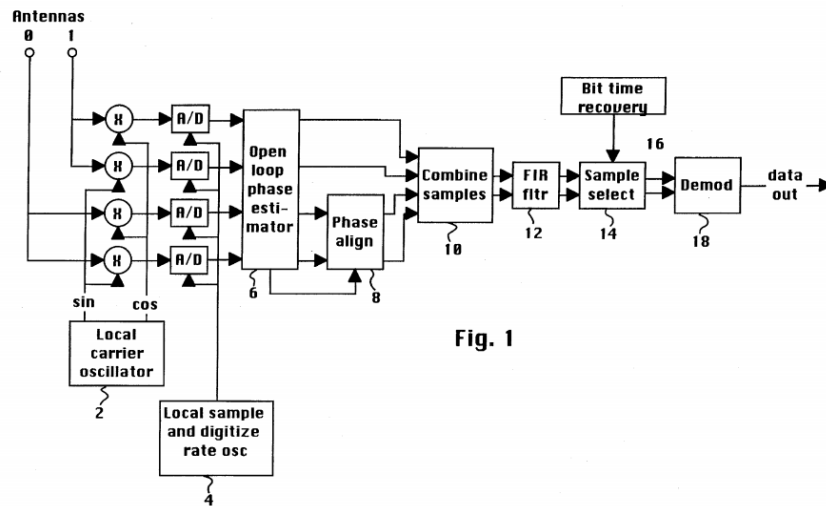


Fig. 1

As discussed above, a POSITA would have been motivated to employ Gardner’s spatially diverse antennas in the first transmitter-receiver 50 of Ito, at least for the reasons of reducing the effects of fading in the received signals. Ex. 1003, ¶ 120. When combined, the antenna 58 of Ito’s first transmitter-receiver 50 would be replaced with Gardner’s spatially diverse antennas. Ex. 1003, ¶ 120. This would have resulted in the receiver being “*configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas.*”

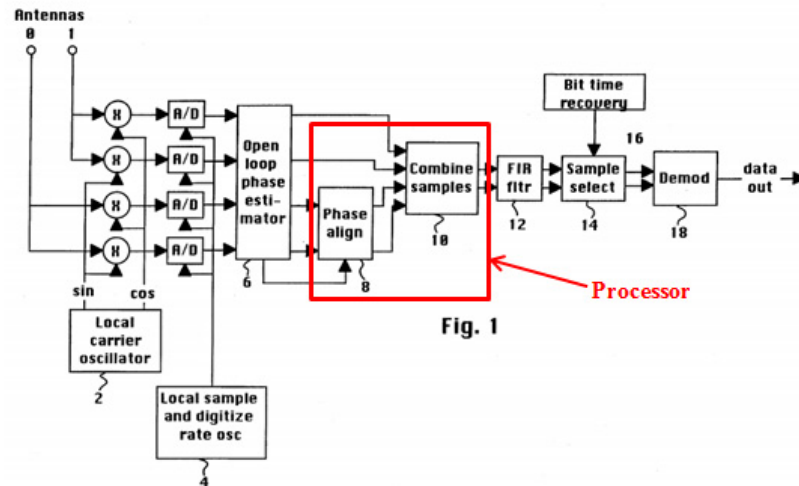
(d) Ito in view of Gardner discloses “a controller configured to align and combine the received fixed port signals.” [10C]

Gardner discloses detecting a phase difference of the signals received from the two spatially diverse antennas. Ex. 1006, 2:64-67. According to Gardner, “[t]his phase difference is used to phase **align**, as shown in block 8, the two digitized signal vectors...by shifting the phase” of the antenna 0 signal to be inphase with the antenna 1 signal. *Id.*, 3:1-7, emphasis added. Therefore, Gardner discloses “*align[ing]...the received fixed port signals.*”⁷

Once the signals have been properly aligned, Gardner discloses “**combining** of the samples as shown in block 10, in the preferred embodiment by adding” the two aligned signals. *Id.*, 3:7-10, emphasis added. Therefore, Gardner also discloses “*combin[ing] the received fixed port signals.*”

⁷ The term “the received radio frequency signals” lacks antecedent basis.

Therefore, for purposes of this petition, the term is interpreted as “the received fixed port signals.”



Gardner further discloses that a processor (*controller*) performs the *aligning* and *combining* functions. Ex. 1006, 2:53-63. Therefore, Gardner discloses “a *controller configured to*” perform the *aligning* and *combining*.

- (e) **Ito in view of Gardner discloses “a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.” [10D]**

As shown in Ito’s Fig. 1, a mobile base device MSS (*movable base station*) facilitates communication between a base station BSS2 (*fixed port*) and a portable device PSS (*mobile device*) located within a vehicle. Whereas the first transmitter-receiver 50 of the mobile base device MSS communicates with the base station BSS2, the second transmitter-receiver 80 (*transmitter*) communicates with the portable device PSS. Ex. 1005, 7:14-16. According to Ito, the mobile base device MSS “receive[s] a signal from the base station BSS2 and **forward[s] it to the portable device PSS2.**” Ex. 1005, 13:15-18, emphasis added. From this

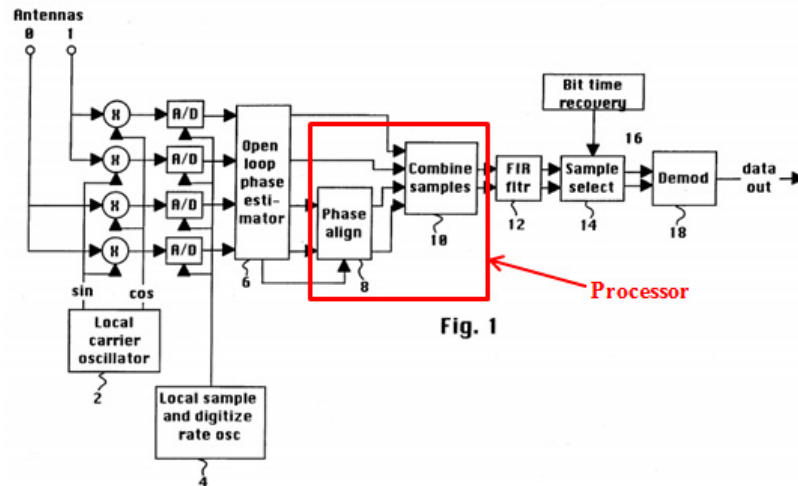
explanation, and the plain meaning of “forward,” a POSITA would have understood that the signal transmitted to the portable device PSS corresponds to those received from the base station BSS2. Ex. 1003, ¶ 124. Ito further explains that this forwarding process is performed for multiple signals. Specifically, Ito discloses both that the portable device PSS receives multiple signals and that the BSS transmits multiple signals. *Id.*, 6:41-46, 8:62-64. Because Ito discloses forwarding a signal received from a base station to the portable device, it would have been obvious to a POSITA that the multiple received signals are forwarded in the same manner. Ex. 1003, ¶ 124. Therefore, Ito in view of Gardner discloses “*a transmitter configured to transmit...signals to a mobile device corresponding to the received fixed port signals.*”

Ito further describes that the signals transmitted to the portable device PSS are “*radio frequency signals.*” For example, Ito discloses that “the portable device PSS and the mobile base device MSS are mutually connected by way of a second radio channel having radio frequencies f_{TA} and f_{RA} ...” Ex. 1005, 11:65-12:1, Abstract.

3. Ito in view of Gardner discloses claim 15.⁸

As discussed above, Ito in view of Gardner discloses “*a controller configured to compare the received fixed port signals received through the spatially separated antennas.*” See Sec. VII.C. Gardner discloses that, while there are many well-known ways to make use of the signals received from the multiple antennas, “[t]he simplest of these is to just choose [sic] the antenna that provides the strongest signal.” Ex. 1006, 1:25-27. In order to identify the strongest signal, a POSITA would have found it obvious to first compare the signals. Ex. 1003, ¶ 127. Gardner suggests this, disclosing that the process of selecting the strongest antenna is “referred to as selection diversity.” Ex. 1006, 1:28. Selection diversity, as opposed to diversity combining, is a well-known technique of comparing properties of multiple received signals for the purpose of selecting a preferred one of the signals. Ex. 1003, ¶ 127. Therefore, Gardner discloses *comparing* the received signals and “*select[ing] a best signal,*” as recited in claim 15.

⁸ It is unclear whether “a controller” in claim 15 is the same as, or different from “a controller” in claim 10. For purposes of this petition, “a controller” in claim 15 is interpreted as “the controller.” However, Ito in view of Gardner renders either interpretation obvious.



Gardner further discloses that a processor (*controller*) performs the *comparing* and *selecting* functions. Ex. 1006, 2:53-63. Therefore, Gardner discloses “a controller configured to” perform the *comparing* and *selecting*.

4. Ito in view of Gardner discloses claim 16.

As discussed above, Ito discloses that the mobile base device MSS (*mobile base station*) receives radio frequency signals from the base station BSS2 via a first receiver-transmitter 50 and forwards them to the portable device PSS2 via a second receiver-transmitter 80 (*transmitter*). Ex. 1005, 13:15-18; *see also* Sec. VII.A. Ito further discloses that the mobile base device MSS “utilizes a FDMA/**TDMA** technique...for communication between a mobile base device MSS and a portable device PSS.” Ex. 1005, 5:47-50, *emphasis added*. In the TDMA configuration, “radio frequencies have a time division signal unit format where a time frame is divided into a number of time slots, e.g., six time slots TS1 through TS6.” *Id.*, 5:51-55. Ito further discloses that the mobile base device MSS transmits signals to

the portable device PSS (via a receiver 21 of the portable device PSS) in the time-division multiplex format: “High frequency signals [are] received by the receiver 21 in each predetermined **time slot**.” *Id.*, 6:40-43, emphasis added. Therefore, Ito discloses “*the transmitter further configured to transmit the radio frequency signals within time slots of time-division multiplex channels.*”

5. Ito in view of Gardner discloses claim 17.

As discussed above in Sec. VIII.A.2, Ito in view of Gardner discloses a mobile base device MSS (*mobile base station*) that “*receive[s] fixed port signals from a fixed port through the plurality of antennas.*” Ito further discloses that the mobile base device MSS “may be constituted by an automobile telephone main unit installed in a car.” Ex. 1005, 3:17-23. Therefore, Ito discloses that the mobile base device MSS is “*conveyed by a vehicle.*”

6. Ito in view of Gardner discloses claim 18.

As discussed above, Ito discloses that the mobile base device MSS (*mobile base station*) “may be constituted by an automobile telephone main unit installed in a car.” Ex. 1005, 3:17-23. Therefore, Ito discloses that “*the vehicle is an automotive vehicle.*”

7. Ito in view of Gardner renders obvious claim 31.

(a) Ito in view of Gardner discloses “[a] movable base station configured to move relative to Earth, the movable base station comprising.”⁹ [31P]

As shown in Fig. 6 of Ito, an automobile is equipped with a mobile base device MSS (*movable base station*). Ex. 1005, 12:52-53. The mobile base device MSS communicates with a fixed base station BSS, and communicates with one or more portable devices PSS within the automobile. In this manner, the mobile base device MSS facilitates communication between the portable device PSS and the base station BSS. Because the mobile base device MSS is located in an automobile, it would have been obvious to a POSITA that the mobile base device MSS is “*configured to move relative to Earth*.” Ex. 1003, ¶ 137.

(b) Ito in view of Gardner discloses “a plurality of spatially separated antennas.” [31A]

As shown in Ito’s Fig. 1 (annotated below), the mobile base device MSS (*movable base station*) facilitates communication between a stationary base station BSS2 and a portable device PSS located within the vehicle. *See id.*, 5:62-65. As shown in Ito’s Fig. 3, the mobile base device MSS includes a first transmitter-

⁹ In the event that the preambles of the challenged independent claims are deemed limiting, which Petitioner does not concede, Petitioner has demonstrated the obviousness of those limitations in all Grounds.

receiver 50 “used for radio communication with the base station BSS,” and includes a second transmitter-receiver 80 “used for radio communication with its portable device PSS.” Ex. 1005, 7:12-16.

Ito does not explicitly disclose that first transmitter-receiver 50 includes “*a plurality of spatially separated antennas*.” However, Gardner discloses this limitation. Specifically, Gardner discloses a modular receiver for use in cellular communications, like that of Ito. Ex. 1006, 1:10-12. Gardner explains that “[o]ne of the most useful techniques for improving receiver performance in the mobile (Rayleigh) channel is to use spatial diversity.” *Id.*, 1:15-17. Gardner further explains that spatial diversity is achieved by “us[ing] two (or more) antennas spaced far enough apart” so as to reduce the effects of fading on the received signal. *Id.*, 1:15-20. Gardner explains that, during operation, multiple “RF signals [are] received on the two antennas” in order to improve receiver performance and combat fading issues. *Id.*, 2:24-30; 1:15-24. Gardner illustrates this configuration in Fig. 1, where “two spatially diverse antennas 0 and 1 are used.” *Id.*, 2:23-24. Therefore, Gardner discloses “*a plurality of spatially separated antennas*.”

As discussed above, a POSITA would have been motivated to employ Gardner’s spatially diverse antennas in the first transmitter-receiver 50 of Ito, at least for the reasons of reducing the effects of fading in the received signals. Ex. 1003, ¶ 140. When combined, the antenna 58 of Ito’s first transmitter-receiver 50

would be replaced with Gardner's spatially diverse antennas. Ex. 1003, ¶ 140. This would have resulted in Ito's mobile base unit MSS having "*a plurality of spatially separated antennas.*"

(c) Ito in view of Gardner discloses the "a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas." [31B]

Ito discloses a wireless communication environment for providing communication capabilities to a portable device PSS located within a moving vehicle. Ex. 1005, 1:8-13, Fig. 1. In order to achieve this objective, Ito describes outfitting the vehicle with a mobile base device MSS (*movable base station*). *Id.* As shown in Ito's Fig. 1 (annotated below), the mobile base device MSS facilitates communication between a stationary base station BSS2 (*fixed port*) and a portable device PSS located within the vehicle. *See id.*, 5:62-65.

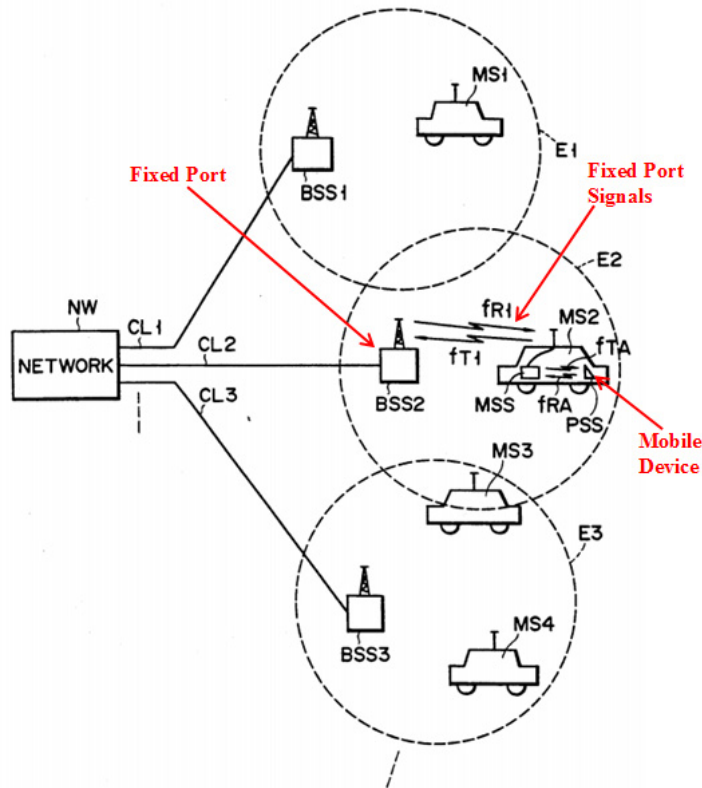


FIG. 1

As shown in Ito's Fig. 3, the mobile base device MSS includes a first transmitter-receiver 50 (*receiver*) "used for radio communication with the base station BSS," and includes a second transmitter-receiver 80 "used for radio communication with its portable device PSS." Ex. 1005, 7:12-16. The MSS thus "receive[s] a signal from the base station BSS2" (*receive [a] fixed port signal[] from a fixed port*) via the first transmitter-receiver 50 and "forward[s] it to the portable device PSS2" via the second transmitter-receiver 80. *Id.*, 13:15-18.

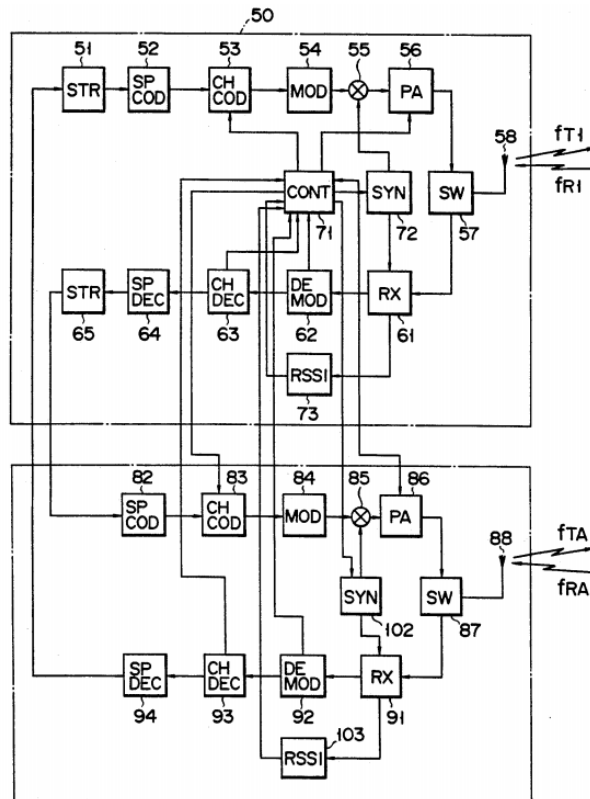
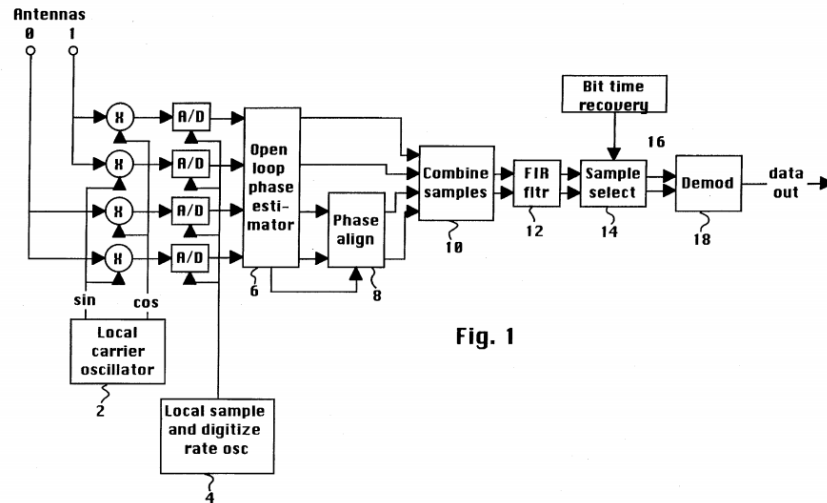


FIG. 3

Ito does not explicitly disclose that first transmitter-receiver 50 includes “*spatially separated antennas*” for receiving multiple “*fixed port signals*.” However, Gardner discloses this limitation. Specifically, Gardner discloses a modular receiver for use in cellular communications, like that of Ito. Ex. 1006, 1:10-12. Gardner explains that “[o]ne of the most useful techniques for improving receiver performance in the mobile (Rayleigh) channel is to use spatial diversity.” *Id.*, 1:15-17. Gardner further explains that spatial diversity is achieved by “us[ing] two (or more) antennas spaced far enough apart” so as to reduce the effects of fading on the received signal. *Id.*, 1:15-20. Gardner explains that, during operation, multiple “RF signals [are] received on the two antennas” in order to improve

receiver performance and combat fading issues. *Id.*, 2:24-30; 1:15-24. Gardner illustrates this configuration in Fig. 1, where “two spatially diverse antennas 0 and 1 are used.” *Id.*, 2:23-24. Therefore, Gardner discloses “*receiv[ing] fixed port signals ... through the plurality of spatially separated antennas.*”



As discussed above, a POSITA would have been motivated to employ Gardner’s spatially diverse antennas in the first transmitter-receiver 50 of Ito, at least for the reasons of reducing the effects of fading in the received signals. Ex. 1003, ¶ 144. When combined, the antenna 58 of Ito’s first transmitter-receiver 50 would be replaced with Gardner’s spatially diverse antennas. Ex. 1003, ¶ 144. This would have resulted in the receiver being “*configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas.*”

- (d) **Ito in view of Gardner discloses “a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.” [31C]**

As shown in Ito’s Fig. 1, a mobile base device MSS (*movable base station*) facilitates communication between a base station BSS2 (*fixed port*) and a portable device PSS (*mobile device*) located within a vehicle. Whereas the first transmitter-receiver 50 of the mobile base device MSS communicates with the base station BSS2, the second transmitter-receiver 80 (*transmitter*) communicates with the portable device PSS. Ex. 1005, 7:14-16. According to Ito, the mobile base device MSS “receive[s] a signal from the base station BSS2 and **forward[s] it to the portable device PSS2.**” Ex. 1005, 13:15-18, emphasis added. From this explanation, and the plain meaning of “forward,” a POSITA would have understood that the signal transmitted to the portable device PSS corresponds to those received from the base station BSS2. Ex. 1003, ¶ 145. Ito further explains that this forwarding process is performed for multiple signals. Specifically, Ito discloses both that the portable device PSS receives multiple signals and that the BSS transmits multiple signals. Ex. 1005, 6:41-46, 8:62-64. Because Ito discloses forwarding a signal received from a base station to the portable device, it would have been obvious to a POSITA that the multiple received signals are forwarded in the same manner. Ex. 1003, ¶ 145. Therefore, Ito in view of Gardner discloses “a

transmitter configured to transmit...signals to a mobile device corresponding to the received fixed port signals.”

Ito further describes that the signals transmitted to the portable device PSS are “*radio frequency signals.*” For example, Ito discloses that “the portable device PSS and the mobile base device MSS are mutually connected by way of a second radio channel having radio frequencies fTA and fRA...” Ex. 1005, 11:65-12:1, Abstract.

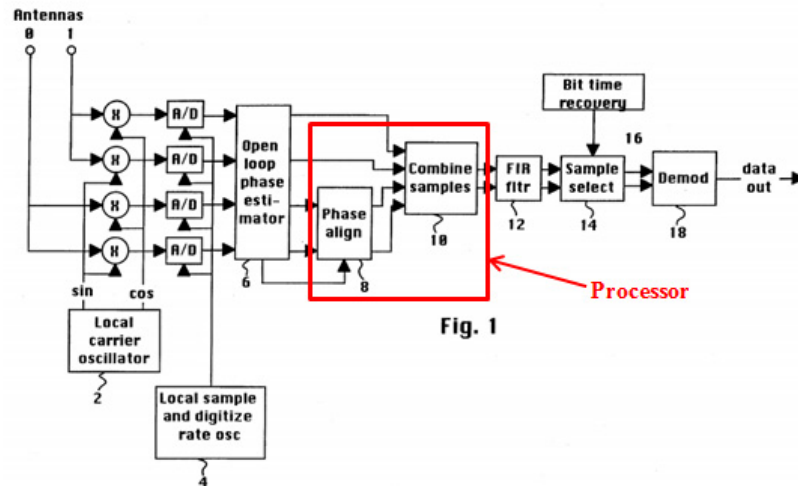
(e) Ito in view of Gardner discloses “the radio frequency signals transmitted within time slots of time-division multiplex channels.” [31D]

As discussed above, Ito discloses that the mobile base device MSS (*movable base station*) receives radio frequency signals from the base station BSS2 via a first receiver-transmitter 50 and forwards them to the portable device PSS via a second receiver-transmitter 80 (*transmitter*). Ex. 1005, 13:15-18; *see also* Sec. VIII.A.2. Ito further discloses that the mobile base device MSS “utilizes a FDMA/TDMA technique...for communication between a mobile base device MSS and a portable device PSS.” Ex. 1005, 5:47-50, *emphasis added*. In the TDMA configuration, “radio frequencies have a time division signal unit format where a time frame is divided into a number of time slots, e.g., six time slots TS1 through TS6.” *Id.*, 5:51-55. Ito further discloses that the mobile base device MSS transmits signals to the portable device PSS (via a receiver 21 of the portable device PSS) in the time-

division multiplex format: “High frequency signals [are] received by the receiver 21 in each predetermined **time slot**.” *Id.*, 6:40-43, emphasis added. Therefore, Ito discloses “*the radio frequency signals transmitted within time slots of time-division multiplex channels.*”

8. Ito in view of Gardner discloses claim 33.

As discussed above, Ito in view of Gardner discloses that the mobile base device MSS (*movable base station*) comprises “*a controller configured to compare the received fixed port signals received through the spatially separated antennas.*” See Sec. VIII.A.2. Gardner discloses that, while there are many well-known ways to make use of the signals received from the multiple antennas, “[t]he simplest of these is to just choose [sic] the antenna that provides the strongest signal.” Ex. 1006, 1:25-27. In order to identify the strongest signal, a POSITA would have found it obvious to first compare the signals. Ex. 1003, ¶ 149. Gardner suggests this, disclosing that the process of selecting the strongest antenna is “referred to as selection diversity.” Ex. 1006, 1:28. Selection diversity, as opposed to diversity combining, is a well-known technique of comparing properties of multiple received signals for the purpose of selecting a preferred one of the signals. Ex. 1003, ¶ 149. Therefore, Gardner discloses *comparing* the received signals and “*select[ing] a best signal,*” as recited in claim 33.



Gardner further discloses that a processor (*controller*) performs the *comparing* and *selecting* functions. Ex. 1006, 2:53-63. Therefore, Gardner further discloses “a controller configured to” perform the *comparing* and *selecting*.

9. Ito in view of Gardner discloses claim 34.

As discussed above in Sec. VIII.A.2, Ito in view of Gardner discloses a mobile base device MSS (*movable base station*) that is “receive[s] fixed port signals from a fixed port through the plurality of antennas.” Ito further discloses that the mobile base device MSS “may be constituted by an automobile telephone main unit installed in a car.” Ex. 1005, 3:17-23. Therefore, Ito discloses that the mobile base device MSS is “conveyed by a vehicle.”

10. Ito in view of Gardner discloses claim 35.

As discussed above, Ito discloses that the mobile base device MSS (*movable base station*) “may be constituted by an automobile telephone main unit installed

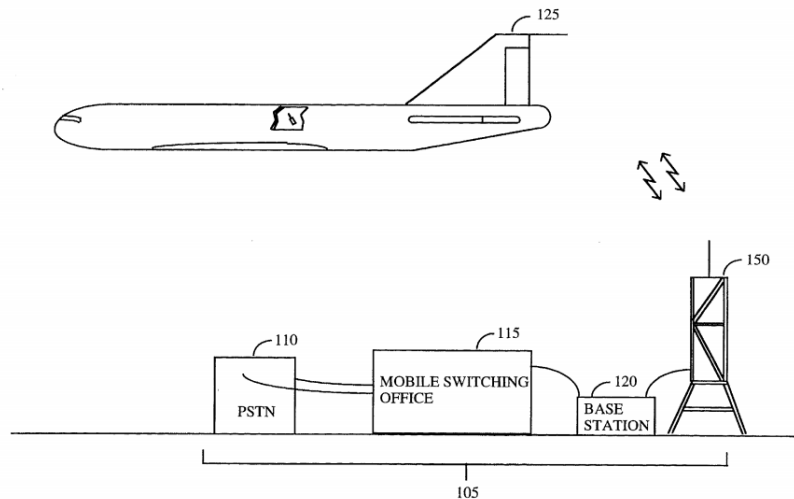
in a car.” Ex. 1005, 3:17-23. Therefore, Ito discloses that “*the vehicle is an automotive vehicle.*”

B. Ground 2: Claims 10, 15-18, 31, and 33-35 are obvious over Gilhousen865 in view of Gilhousen390.

1. A POSITA would have been motivated to combine Gilhousen865 and Gilhousen390.

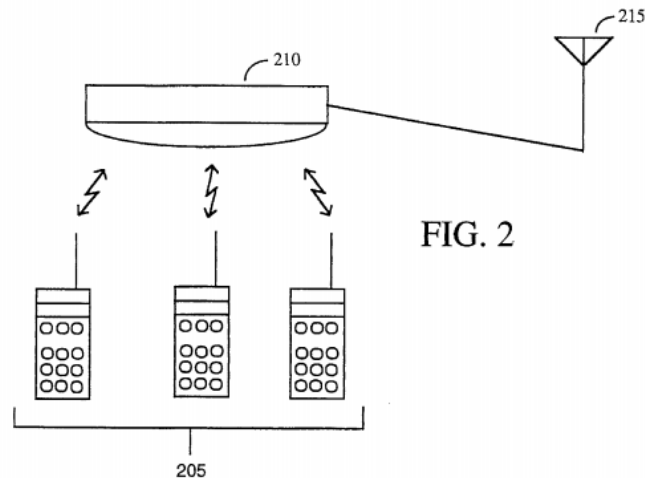
Gilhousen865 describes a system for providing communications between a ground base station and a wireless telephone located on an airplane. Ex. 1009, 1:7-10. Specifically, the system of Gilhousen865 includes a ground based subsystem and an airborne based subsystem. *Id.*, 2:9-12.

FIG. 1



The ground subsystem includes a base station 120 coupled to the public switched telephone network (PSTN) 110 via a switching center 115. The base station 120 wirelessly transmits signals to, and receives signals from,

radiotelephones to provide communication between the radiotelephones and the network 110. *Id.*, 2:24-33. According to Gilhousen865, the base station “is coupled to an antenna (150) that receives and radiates the CDMA radiotelephone signals.” *Id.*, 2:32-33.



The airborne subsystem, on the other hand, includes a repeater 210 installed in the airplane in which the wireless phone 205 is located. As shown in Fig. 2 above, the repeater includes an external antenna 215 that sends and receives signals with the base station. *See id.*, 2:53-65. According to Gilhousen865, the system can function both to provide outgoing calls from the radiotelephone to the ground base station, and incoming calls originating from the ground subsystem to the airborne radiotelephone. *See id.*, 2:53-63.

Deleterious effects on wirelessly-transmitted signals, such as fading, interference, and other degradations to signal quality were well-known at the time of the '701 patent. Ex. 1003, ¶ 158. However, Gilhousen865 does not describe any

measures for countering those negative effects. Therefore, a POSITA would have been motivated to look to the prior art, such as Gilhousen390, for methods of reducing the negative effects on signals during wireless transmission.

Gilhousen390 would have been a particularly relevant starting point, as it is by the same inventor as Gilhousen865.

Like Gilhousen865, Gilhousen390 discloses a wireless communication system specifically applicable to communications terminals associated with moving vehicles. *See, e.g.,* Ex. 1007, Fig. 1. Specifically, Gilhousen390 explains that fading, a common negative effect a signal quality in wireless transmissions, can be especially profound with respect to signals transmitted to/from a vehicle. *Id.*, 3:17-22. In order to counter the negative effects of fading, Gilhousen390 describes employing various configurations to achieve signal diversity at the receiver. In one such example, Gilhousen390 describes cell-site diversity, in which a mobile terminal receives signals from multiple base stations simultaneously. *Id.*, 11:58-62. For example, as shown in Gilhousen390's Fig. 1, a receiver 16 may simultaneously receive signal transmissions from both cell-sites 12 and 14. In another example, Gilhousen390 describes configuring the receiver with multiple antennas for "space diversity." *Id.*, 14:36-39.

Gilhousen390 illustrates an exemplary mobile unit in Fig. 2. *Id.*, 11:63-64. The mobile unit includes an antenna 30 connected to multiple receivers 40 and 42.

Id., 13:21-22. The antenna 30 receives signals from multiple base stations, which it forwards to data receivers 40 and 42. *Id.*, 12:34-36. The data receivers are controlled by a control processor to tune to received signals with the best signal qualities from among those received. *Id.*, 13:10-12. Each of the data receivers 40 and 42 is capable of tuning to a different signal. *Id.* Therefore, when “another cell-site transmitted pilot signal is of greater signal strength than the current cell-site signal strength,” one of the receivers will be retuned such that “[r]eceptors 40 and 42...handle calls through two different cell-sites.” *Id.*, 13:12-20.

Based on the teachings of Gilhousen390, a POSITA would have been motivated to modify Gilhousen865’s system with any one or more of the signal diversity configurations of Gilhousen390 at least for the purpose of reducing the errors caused by well-known deleterious effects on wirelessly-transmitted signals. Ex. 1003, ¶ 161. As shown in Gilhousen390’s Fig. 3, Gilhousen865’s repeater could be modified with multiple data receivers that are individually configurable to extract different signals received from different base stations and/or with multiple antennas for space diversity, as taught by Gilhousen390. Ex. 1003, ¶ 161. Modifying Gilhousen865 in this manner would have required minimal modifications. Ex. 1003, ¶ 161.

In addition to the motivations described above, a POSITA would have been further motivated to combine Gilhousen865 and Gilhousen390 because both are in

the same general field of mobile communications, address the same problem—improving the performance of wireless communication systems, and are both by the same named inventor. Ex. 1003, ¶ 162. Further, as evident from the above discussion, a POSITA could have combined the system of Gilhousen865 with the teachings of Gilhousen390 by known methods, and the results of the combination would have been predictable to a POSITA (e.g., by replacing Gilhousen865’s antenna with spatially separated antennas). Ex. 1003, ¶ 162. Finally, the proposed combination of Gilhousen865 and Gilhousen390 would involve nothing more than incorporating well-known concepts (i.e., Gilhousen390’s diversity techniques) into a well-known system (i.e., Gilhousen865 radio communication system). Ex. 1003, ¶ 162; *KSR*, 550 U.S. at. 419-421.

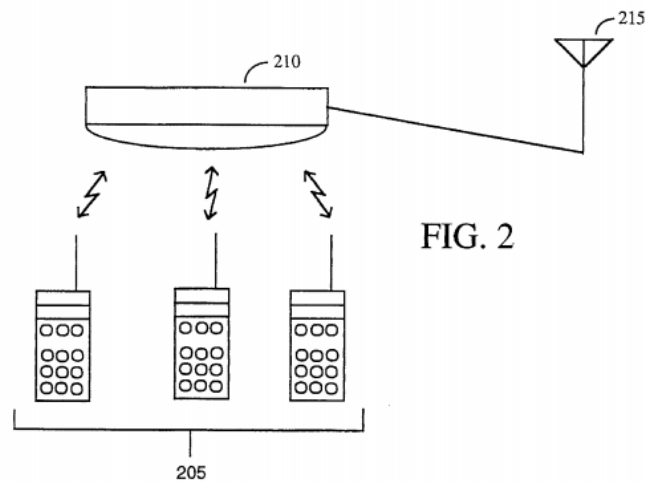
2. Gilhousen865 in view of Gilhousen390 renders obvious claim 10.

(a) Gilhousen865 in view of Gilhousen390 discloses “[a] movable base station configured to move relative to Earth, the movable base station comprising.” [10P]

As discussed above, Gilhousen865 describes a repeater 210 (*movable base station*) installed in an airplane that functions both to provide outgoing calls from the radiotelephone to the ground base station, and incoming calls originating from the ground subsystem to the airborne radiotelephone. *See* Ex. 1009, 2:53-63. Because the repeater is installed in an airplane, it would have been obvious to a POSITA that the repeater is “*configured to move relative to Earth.*”

(b) Gilhousen865 in view of Gilhousen390 discloses “a plurality of spatially separated antennas.” [10A]

Gilhousen865 discloses a repeater 210 (*movable base station*) located on an airplane. Ex. 1009, 2:45-48. As shown in Gilhousen865’s Fig. 2, the repeater includes an antenna 215. *Id.*, 2:53-56.

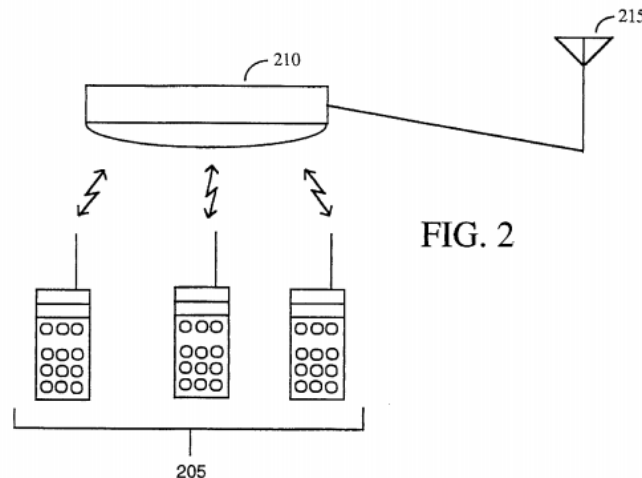


Gilhousen865 does not explicitly disclose that the repeater includes “a plurality of spatially separated antennas.” However, a POSITA would have found it obvious to modify Gilhousen865’s repeater to include a plurality of spatially separated antennas, as taught by Gilhousen390. Specifically, Gilhousen390 describes a cell-site (base station) that includes a two “separate antenna[s]...for space diversity reception.” Ex. 1007, 14:37-39. Spatial diversity was a well-known antenna configuration at the time of the ’701 patent for improving signal quality in the face of a variety of negative effects experienced by the signal during transmission, such as fading. Ex. 1003, ¶ 167. Gilhousen865 describes that the

repeater is a base station when configured to receive calls originating from the ground. Ex. 1009, 3:3-10. Therefore, it would have been obvious to a POSITA to configure Gilhousen865's repeater with "*a plurality of spatially separated antennas,*" as Gilhousen390 employs in its base station, at least for the purposes of achieving the benefits of "space diversity." *See id.*

(c) Gilhousen865 in view of Gilhousen390 discloses "a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas." [10B]

Gilhousen865 discloses a repeater 210 (*movable base station*) located on an airplane. Ex. 1009, 2:45-48. As shown in Gilhousen865's Fig. 2, the repeater includes an antenna 215. *Id.*, 2:53-56.

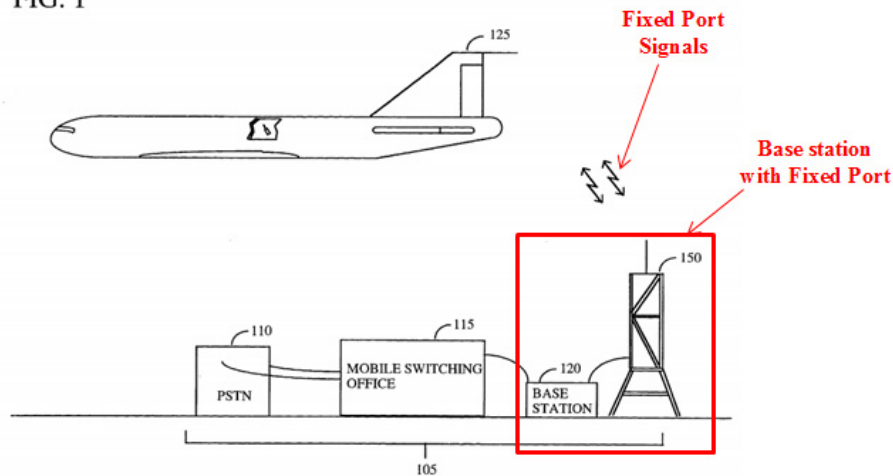


According to Gilhousen865, and as illustrated in annotated Fig. 1 below, the repeater 210 facilitates communication between a radiotelephone and a ground-based base station (*fixed port*), in part by receiving signals (*fixed port signals*) from

the ground-based base station: “Telephone calls from the PSTN to the base station on the ground are transmitted to the outside antenna (215) that relays them to the repeater (210) mounted in the aircraft.” *Id.*, 2:61-63. Therefore, a POSITA would have understood that the repeater 210 includes a *receiver*. Ex. 1003, ¶ 169.

Therefore, Gilhousen865 discloses “a receiver configured to receive fixed port signals from a fixed port through [an antenna].”

FIG. 1



Gilhousen865 does not explicitly disclose that the repeater receives the signals “*through [a] plurality of spatially separated antennas.*” However, a POSITA would have found it obvious to modify Gilhousen865’s repeater to include a plurality of spatially separated antennas, as taught by Gilhousen390. Specifically, Gilhousen390 describes a cell-site (base station) that includes a two “separate antenna[s]...for space diversity reception.” Ex. 1007, 14:37-39. Spatial diversity was a well-known antenna configuration at the time of the ’701 patent for improving signal quality in the face of a variety of negative effects experienced by

the signal during transmission, such as fading. Ex. 1003, ¶ 170. Gilhousen865 describes that the repeater is a base station when configured to receive calls originating from the ground. Ex. 1009, 3:3-10. Therefore, it would have been obvious to a POSITA to configure Gilhousen865's repeater with *a plurality of spatially separated antennas*, as Gilhousen390 employs in its base station, at least for the purposes of achieving the benefits of "space diversity." *See id.*

(d) Gilhousen865 in view of Gilhousen390 discloses "a controller configured to align and combine the received fixed port signals." [10C]

As discussed above, Gilhousen865's repeater 210 (*movable base station*) includes a plurality of spatially diverse antennas, as modified by the teachings of Gilhousen390. *See* Sec. VIII.B.1. When configured for signal diversity in this manner, Gilhousen865's repeater is further modified with a diversity combiner (as taught by Gilhousen390) to process the multiple received signals. Ex. 1003, ¶ 171; *see* Sec VIII.B.1. According to Gilhousen390, the diversity combiner 104 (*controller*) "adjusts the timing of the two streams of received signals into **alignment**." Ex. 1007, 13:22-25. The diversity combiner then "adds [the signals] together." *Id.*, 13:25. Therefore, Gilhousen390 discloses "*a controller configured to align and combine the received fixed port signals.*"

- (e) **Gilhousen865 discloses “a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.” [10D]**

Gilhousen865 explains that the repeater (*movable base station*) receives signals (*fixed port signals*) from the ground base station (*fixed port*), and then “[t]he signals from the ground base stations are received by the external antenna of the airborne subsystem and repeated to the radiotelephones [(*mobile device*)].” Ex. 1009, 3:55-57. Because Gilhousen865 discloses sending the signals to the radiotelephones, a POSITA would have found it obvious that the repeater includes a *transmitter*. Ex. 1003, ¶ 172. Therefore, Gilhousen865 discloses “*a transmitter configured to transmit ...signals to a mobile device corresponding to the received fixed port signals.*”

Gilhousen865 discloses that the telephone is a **radiotelephone**, and that the repeater transmits the signal to the radio telephone from its antenna. *Id.* Therefore, a POSITA would have understood the transmitted signals to be “*radio frequency signals.*” Gilhousen390 also discloses transmitting radio frequency signals: “Receiver 34 receives the RF frequency signals from diplexer 32 which are typically in the 850 MHz frequency band...” Ex. 1007, 12:2-6.

3. Gilhousen865 in view of Gilhousen390 discloses claim 15.

As discussed above, Gilhousen865’s repeater 210 (*movable base station*) includes an antenna 215 that receives signals (*fixed port signals*) from a base

station. Ex. 1009, 2:61-63; *see also* Sec. VII.B. Further, a POSITA would have been motivated to modify the antenna of Gilhousen865's repeater based on the teachings of Gilhousen390 to include a plurality of spatially separated antennas. Ex. 1007, 14:37-39; *see also* Sec. VIII.B.1. Therefore, the combination of Gilhousen865 and Gilhousen390 discloses "*fixed port signals received through the spatially separated antennas.*"

Gilhousen390 further discloses how to process the multiple received signals received via the multiple spatially diverse antennas. Specifically, Gilhousen390 discloses that a diversity combiner 104 (*controller*) receives the multiple signals (e.g., "cell-site signals" in Gilhousen390) and "compares the signal quality indicators accompanying the information bits from the two or more cell-site signals." Ex. 1007, 17:1-4. Therefore, Gilhousen390 discloses "*a controller configured to compare the received fixed port signals.*" Then, the diversity combiner 104 "selects the bits corresponding to the highest quality cell-site on a frame-by-frame basis." *Id.*, 17:4-7. Therefore, Gilhousen390 also discloses "*a controller configured to...select a best signal.*" Gilhousen390 indicates that the diversity combiner 104 performs these functions both in a cell diversity mode (multiple signals from different base stations), or in non-cell-diversity mode (e.g., spatially diverse signals from a single base station). *Id.*, 16:59-66. It would have been obvious to a POSITA to incorporate Gilhousen390's signal selection

functionality into Gilhousen865's repeater for processing the spatially diverse signals received from the base station. Ex. 1003, ¶ 176.

4. Gilhousen865 in view of Gilhousen390 discloses claim 16.

Gilhousen865 discloses a time division protocol as an available communication protocol. Specifically, although Gilhousen865 describes its communication system in terms of Code Division Multiple Access (CDMA), Gilhousen865 indicates that “[a]n alternative embodiment uses the time division multiple access system.” Ex. 1009, 2:15-16. A POSITA would have understood that this communication protocol could be applied to Gilhousen865's repeater in the same manner as it is applied to Gilhousen865's ground based subsystem 105, at least because Gilhousen865 discloses that the repeater “has the same functionality of its ground-based counterpart” for incoming calls. *Id.*, 3:3-10; Ex. 1003, ¶ 178. Additionally, it was well-known in the art that signals transmitted in a time division transmission protocol (such as TDMA, for example) are transmitted “*within time slots of time-division multiplex channels.*” Ex. 1003, ¶ 178. Therefore, Gilhousen865 renders obvious “*the transmitter further configured to transmit the radio frequency signals within time slots of time-division multiplex channels.*”

5. Gilhousen865 in view of Gilhousen390 discloses claim 17.

As discussed above, Gilhousen865 in view of Gilhousen390 discloses a repeater (*movable base station*) that receives signals from a base station (*fixed*

port), “*through the plurality of spatially separated antennas.*” Ex.1009, 2:61-63;
Ex. 1007, 14:37-39; *see also* Sec. VIII.B.2. Gilhousen865 further discloses that the
repeater is mounted in an airplane (*vehicle*). Ex. 1009, 2:45-49. Therefore,
Gilhousen865 in view of Gilhousen390 discloses that the plurality of antennas are
“*conveyed by a vehicle.*”

6. Gilhousen865 in view of Gilhousen390 discloses claim 18.

Gilhousen865 discloses that the repeater 210 (*movable base station*) is
mounted in an airplane (*automotive vehicle*). Ex. 1009, 2:45-49; Ex. 1003, ¶ 182.
Therefore, Gilhousen865 discloses “*wherein the vehicle is an automotive vehicle.*”

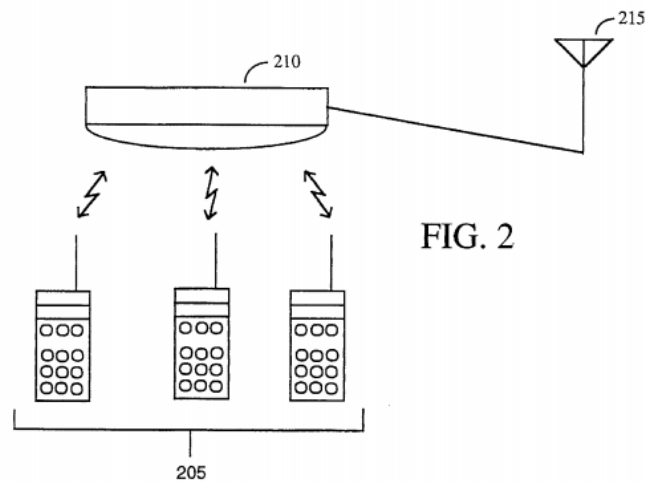
7. Gilhousen865 in view of Gilhousen390 renders obvious claim 31.

(a) Gilhousen865 in view of Gilhousen390 discloses “[a] movable base station configured to move relative to Earth, the movable base station comprising.” [31P]

As discussed above, Gilhousen865 describes a repeater 210 (*movable base station*) installed in an airplane that functions both to provide outgoing calls from the radiotelephone to the ground base station, and incoming calls originating from the ground subsystem to the airborne radiotelephone. *See* Ex. 1009, 2:53-63.
Because the repeater is installed in an airplane, it would have been obvious to a POSITA that the repeater is “*configured to move relative to Earth.*”

(b) Gilhousen865 in view of Gilhousen390 discloses “a plurality of spatially separated antennas.” [31A]

Gilhousen865 discloses a repeater 210 (*movable base station*) located on an airplane. Ex. 1009, 2:45-48. As shown in Gilhousen865’s Fig. 2, the repeater includes an antenna 215. *Id.*, 2:53-56.

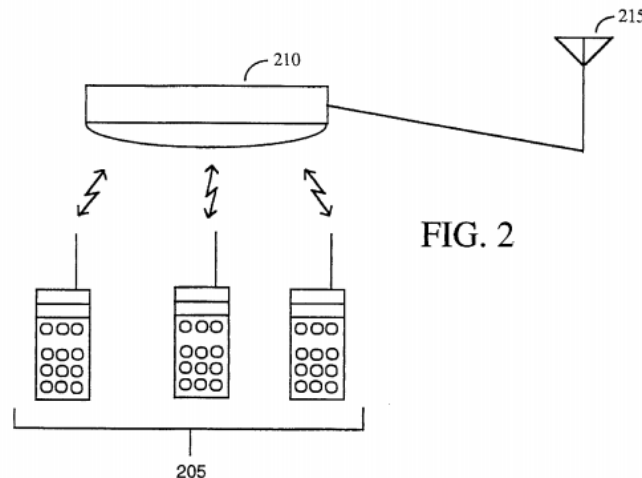


Gilhousen865 does not explicitly disclose that the repeater includes “a plurality of spatially separated antennas.” However, a POSITA would have found it obvious to modify Gilhousen865’s repeater to include a plurality of spatially separated antennas, as taught by Gilhousen390. Specifically, Gilhousen390 describes a cell-site (base station) that includes a two “separate antenna[s]...for space diversity reception.” Ex. 1007, 14:37-39. Spatial diversity was a well-known antenna configuration at the time of the ’701 patent for improving signal quality in the face of a variety of negative effects experienced by the signal during transmission, such as fading. Ex. 1003, ¶ 187. Gilhousen865 describes that the

repeater is a base station when configured to receive calls originating from the ground. Ex. 1009, 3:3-10. Therefore, it would have been obvious to a POSITA to configure Gilhousen865's repeater with "*a plurality of spatially separated antennas,*" as Gilhousen390 employs in its base station, at least for the purposes of achieving the benefits of "space diversity." *See id.*

(c) Gilhousen865 in view of Gilhousen390 discloses "a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas." [31B]

Gilhousen865 discloses a repeater 210 (*movable base station*) located on an airplane. Ex. 1009, 2:45-48. As shown in Gilhousen865's Fig. 2, the repeater includes an antenna 215. *Id.*, 2:53-56.

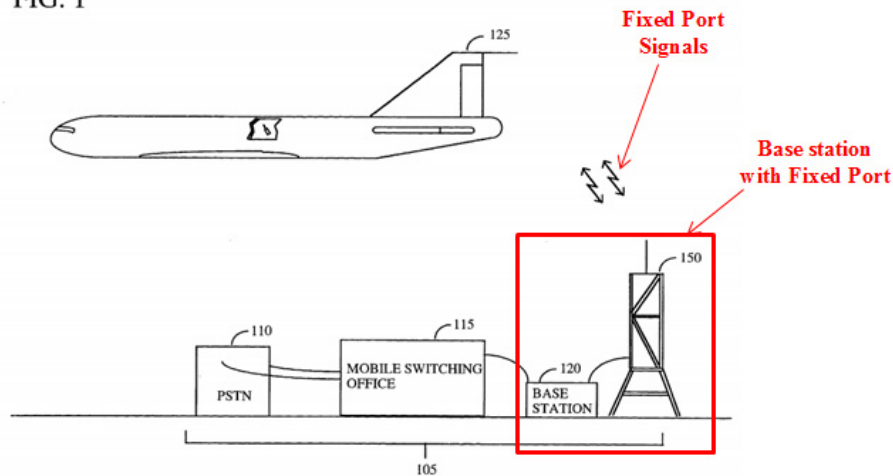


According to Gilhousen865, and as illustrated in annotated Fig. 1 below, the repeater 210 facilitates communication between a radiotelephone and a ground-based base station (*fixed port*), in part by receiving signals (*fixed port signals*) from

the ground-based base station: “Telephone calls from the PSTN to the base station on the ground are transmitted to the outside antenna (215) that relays them to the repeater (210) mounted in the aircraft.” *Id.*, 2:61-63. Therefore, a POSITA would have understood that the repeater 210 includes a *receiver*. Ex. 1003, ¶ 189.

Therefore, Gilhousen865 discloses “a receiver configured to receive fixed port signals from a fixed port through [an antenna].”

FIG. 1



Gilhousen865 does not explicitly disclose that the repeater receives the signals “*through [a] plurality of spatially separated antennas.*” However, a POSITA would have found it obvious to modify Gilhousen865’s repeater to include a plurality of spatially separated antennas, as taught by Gilhousen390. Specifically, Gilhousen390 describes a cell-site (base station) that includes a two “separate antenna[s]...for space diversity reception.” Ex. 1007, 14:37-39. Spatial diversity was a well-known antenna configuration at the time of the ’701 patent for improving signal quality in the face of a variety of negative effects experienced by

the signal during transmission, such as fading. Ex. 1003, ¶ 190. Gilhousen865 describes that the repeater is a base station when configured to receive calls originating from the ground. Ex. 1009, 3:3-10. Therefore, it would have been obvious to a POSITA to configure Gilhousen865's repeater with "*a plurality of spatially separated antennas*," as Gilhousen390 employs in its base station, at least for the purposes of achieving the benefits of "space diversity." *See id.*

(d) Gilhousen865 discloses "a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals." [31C]

Gilhousen865 explains that the repeater (*movable base station*) receives signals (*fixed port signals*) from the ground base station (*fixed port*), and then "[t]he signals from the ground base stations are received by the external antenna of the airborne subsystem and repeated to the radiotelephones [*(mobile device)*]." Ex. 1009, 3:55-57. Because Gilhousen865 discloses sending the signals to the radiotelephones, a POSITA would have found it obvious that the repeater includes a *transmitter*. Ex. 1003, ¶ 191. Therefore, Gilhousen865 discloses "*a transmitter configured to transmit ...signals to a mobile device corresponding to the received fixed port signals.*"

Gilhousen865 discloses that the telephone is a **radiotelephone**, and that the repeater transmits the signal to the radio telephone from its antenna. *Id.* Therefore, a POSITA would have understood the transmitted signals to be "*radio frequency*

signals.” Gilhousen390 also discloses transmitting radio frequency signals:

“Receiver 34 receives the RF frequency signals from diplexer 32 which are typically in the 850 MHz frequency band...” Ex. 1007, 12:2-6.

(e) Gilhousen865 in view of Gilhousen390 discloses “the radio frequency signals transmitted within time slots of time-division multiplex channels.” [31D]

Gilhousen865 discloses a time division protocol as an available communication protocol. Specifically, although Gilhousen865 describes its communication system in terms of Code Division Multiple Access (CDMA), Gilhousen865 indicates that “[a]n alternative embodiment uses the time division multiple access system.” Ex. 1009, 2:15-16. A POSITA would have understood that this communication protocol could be applied to Gilhousen865’s repeater in the same manner as it is applied to Gilhousen865’s ground based subsystem 105, at least because Gilhousen865 discloses that the repeater “has the same functionality of its ground-based counterpart” for incoming calls. *Id.*, 3:3-10; Ex. 1003, ¶ 193. Additionally, it was well-known in the art that signals transmitted in a time division transmission protocol (such as TDMA, for example) are transmitted “*within time slots of time-division multiplex channels.*” Ex. 1003, ¶ 193. Therefore, Gilhousen865 renders obvious “*a transmitter configured to transmit radio frequency signals ...within time slots of time-division multiplex channels.*”

8. Gilhousen865 in view of Gilhousen390 discloses claim 33.

As discussed above, Gilhousen865's repeater 210 (*movable base station*) includes an antenna 215 that receives signals (*fixed port signals*) from a base station. Ex. 1009, 2:61-63; *see also* Sec. VII.B. Further, a POSITA would have been motivated to modify the antenna of Gilhousen865's repeater based on the teachings of Gilhousen390 to include a plurality of spatially separated antennas. Ex. 1007, 14:37-39; *see also* Sec. VIII.B.1. Therefore, the combination of Gilhousen865 and Gilhousen390 discloses "*fixed port signals received through the spatially separated antennas.*"

Gilhousen390 further discloses how to process the multiple received signals received via the multiple spatially diverse antennas. Specifically, Gilhousen390 discloses that a diversity combiner 104 (*controller*) receives the multiple signals (e.g., "cell-site signals" in Gilhousen390) and "compares the signal quality indicators accompanying the information bits from the two or more cell-site signals." Ex. 1007, 17:1-4. Therefore, Gilhousen390 discloses "*a controller configured to compare the received fixed port signals.*" Then, the diversity combiner 104 "selects the bits corresponding to the highest quality cell-site on a frame-by-frame basis." *Id.*, 17:4-7. Therefore, Gilhousen390 also discloses "*a controller configured to...select a best signal.*" Gilhousen390 indicates that the diversity combiner 104 performs these functions both in a cell diversity mode

(multiple signals from different base stations), or in non-cell-diversity mode (e.g., spatially diverse signals from a single base station). *Id.*, 16:59-66. It would have been obvious to a POSITA to incorporate Gilhousen390's signal selection functionality into Gilhousen865's repeater for processing the spatially diverse signals received from the base station. Ex. 1003, ¶ 196.

9. Gilhousen865 in view of Gilhousen390 discloses claim 34.

As discussed above, Gilhousen865 in view of Gilhousen390 discloses a repeater (*movable base station*) that receives signals from a base station (*fixed port*), “*through the plurality of spatially separated antennas.*” Ex.1009, 2:61-63; Ex. 1007, 14:37-39; *see also* Sec. VIII.B.2. Gilhousen865 further discloses that the repeater is mounted in an airplane (*vehicle*). Ex. 1009, 2:45-49. Therefore, Gilhousen865 in view of Gilhousen390 discloses that the plurality of antennas are “*conveyed by a vehicle.*”

10. Gilhousen865 in view of Gilhousen390 discloses claim 35.

Gilhousen865 discloses that the repeater 210 (*mobile base station*) is mounted in an airplane (*automotive vehicle*). Ex. 1009, 2:45-49; Ex. 1003, ¶ 200. Therefore, Gilhousen865 discloses “*wherein the vehicle is an automotive vehicle.*”

IX. Conclusion

For the reasons above, *inter partes* review of claims 10, 15-18, 31, and 33-35 of U.S. Patent No. 7,848,701 is requested.

Respectfully submitted,

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**CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION,
TYPEFACE REQUIREMENTS, AND TYPE STYLE REQUIREMENTS**

1. This Petition complies with the type-volume limitation of 14,000 words, comprising 12,705 words, excluding the parts exempted by 37 C.F.R. § 42.24(a).

2. This Petition complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word 2010 in 14 point Times New Roman.

Respectfully submitted,

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*Petition for Inter Partes Review of
U.S. Patent No. 7,848,701*

CERTIFICATION OF SERVICE (37 C.F.R. §§ 42.6(e), 42.105(a))

The undersigned hereby certifies that on May 20, 2019, true and correct copies of the foregoing **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,848,701**, Petitioner's Power of Attorney, and all associated exhibits were served in their entirety on the following parties via FedEx Express®:

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