Oral Argument Demonstratives

Patent Owner Carucel Investments, L.P.

IPR2019-01079 / IPR2019-01103
U.S. Patent No. 7,979,023

IPR2019-01102
U.S. Patent No. 7,848,701

IPR2019-01101 / IPR2019-01573
U.S. Patent No. 7,221,904

IPR2019-01105
U.S. Patent No. 8,718,543

United States Patent and Trademark Office
Patent Trial and Appeal Board

Administrative Patent Judges
Gianetti, Galligan, and Korniczky
Oral Argument—September 2, 2020

Carucel Investments—Exhibit 2200
IPR2019-01102: VW GoA v. Carucel Investments L.P.

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Overview of Carucel's History

- The Carucel patents concern inventions by the family patriarch, Charles D. Gavrilovich, Sr., who passed away in July, 2015 after founding Carucel in 1999.
- Carucel is a small, family-owned, limited partnership.
- Charles D. Gavrilovich, Sr. earned a M.S. in electrical engineering and had 39 years of experience in the field of telecommunications, working for leading companies, including Bell Labs, Lucent Technology, and Motorola.

Overview of the Carucel Patents

- The Carucel patents were the culmination of Mr. Gavrilovich's life's work.
- Mr. Gavrilovich invented a "mobile base station" that significantly improved wireless communications by acting as an intermediary between cell towers and mobile devices.
- The mobile base station/apparatus, as shown in Fig. 4 of the Carucel patents, includes an antenna 100 communicating with mobile devices and a second antenna 101 communicating with fixed base stations, i.e., cell towers.

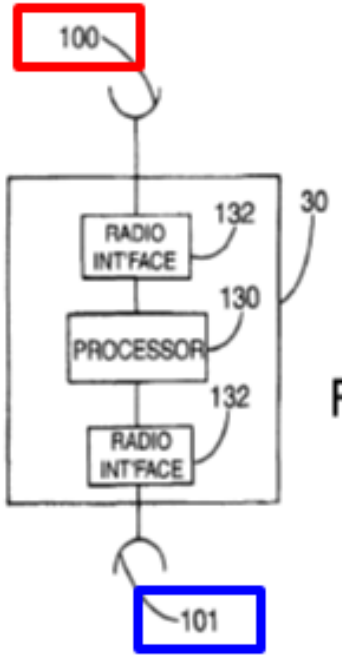


Fig. 4

'023 Patent, Ex. 1001, Figure 4.

Overview of the Carucel Patents

- The mobile base station/apparatus provides a communication path between the mobile devices and cellular network that increases the available data bandwidth and quality of wireless service, which in turn provides important, tangible benefits to consumers by enabling fewer dropped calls and higher data throughput.

- At the time of the invention in 1995, conventional consumer cellular networks generally did not provide high bandwidth to mobile users.

The Inventions of the Carucel Patents Is Not Directed Toward Cordless Phones

- The Carucel Patents and Claims are not directed to a Cordless Phone System.
- A "cordless telephone" is described as a standard, wired telephone that has only replaced the handset cord with a radio link.
- A cordless telephone is basically a combination telephone and radio transmitter/receiver having two major parts: base and handset.
- The base is typically attached to the phone jack through a standard phone wire connection, and as far as the phone system is concerned it looks just like a normal phone.

The Inventions of the Carucel Patents Is Not Directed Toward Cordless Phones

- The base receives the incoming call (as an electrical signal) through the phone line, converts it to an FM radio signal and then broadcasts that signal.
- The common characteristics of a cordless phone are: (1) the base is connected to a fixed telephone line; (2) the curled cord between the telephone and handset is replaced by a radio link; (3) the handset only includes a basic telephone key pad; (4) the cordless handset is not capable of communicating with a cellular network.
- At no point does the handset of a cordless phone (i) register with a cell network; (ii) communicate directly with a cell network; or (iii) move freely between mobile base stations.

Claim Construction

- "Fixed Port"
- **"Configured to" / "Adapted to"**
- "Transmit Radio Frequency Signals To a Mobile Device Corresponding to the Received Fixed Port Signals"
- "Wherein the Receiver is Further Configured to Receive Fixed Port Signals from a Plurality of Fixed Ports"
- **"Mobile Device" / "Mobile Unit"**
- **"Automotive Vehicle"**

Claim Construction

Chamberlain Group, Inc. v. Lear Corp.

Claim terms are interpreted from the point of view of a POSITA who "is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification."

A disputed term should be construed by first examining the intrinsic evidence of record from the perspective of one skilled in the relevant art.

Chamberlain Group, Inc. v. Lear Corp., 516 F.3d 1331, 1333-35 (Fed. Cir. 2008).

Claim Construction

Chamberlain Group, Inc. v. Lear Corp.

It is "entirely appropriate for a court, when conducting claim construction, to rely heavily on the written description for guidance as to the meaning of the claims."

The prosecution history may also be helpful. However, "it often lacks the clarity of the specification and thus is less useful for claim construction purposes."

Chamberlain Group, Inc. v. Lear Corp., 516 F.3d 1331, 1335-37 (Fed. Cir. 2008).

"Configured To" / "Adapted to"

- A civil court construed the term "configured to" as "constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic":

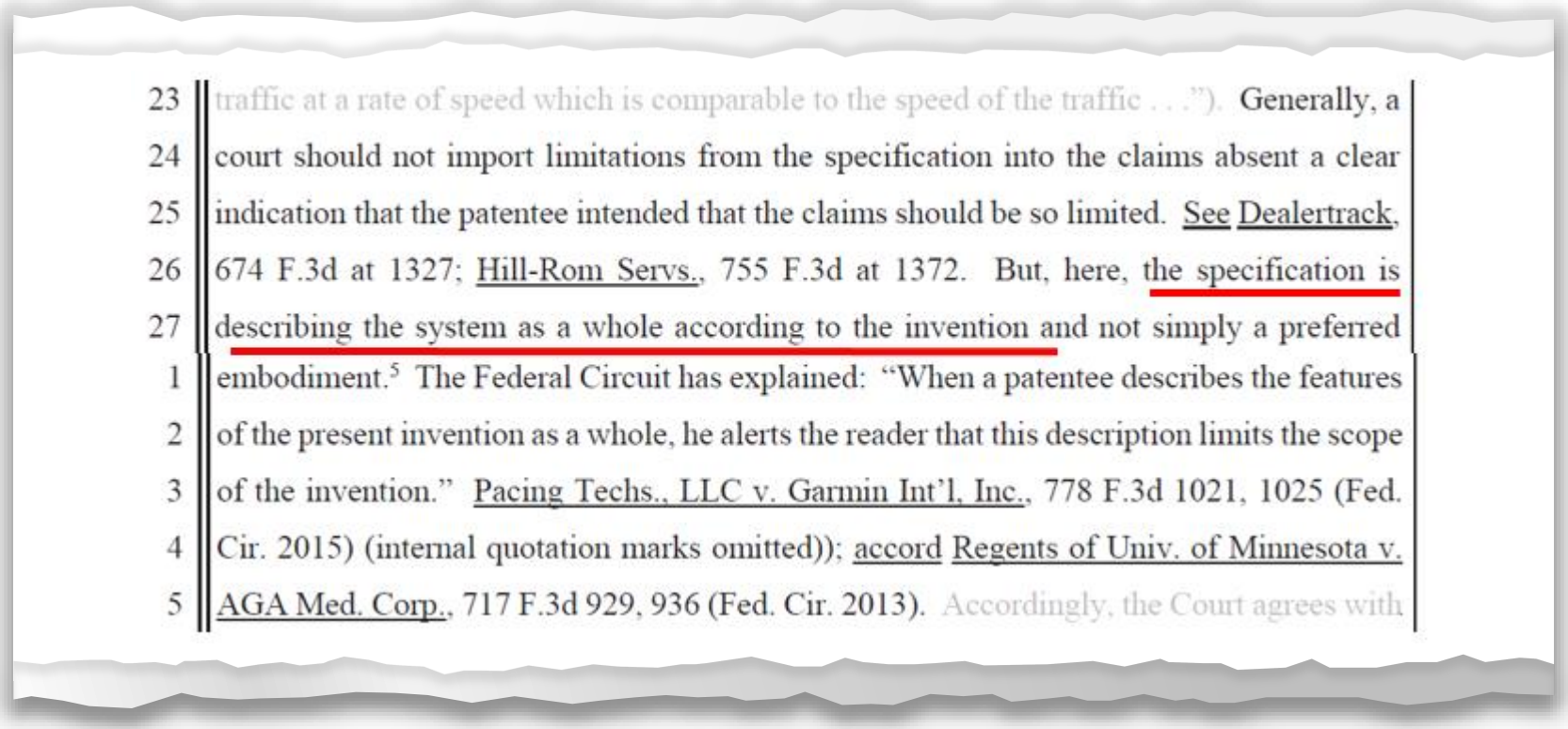
> construction of these two terms.[7] In sum, the Court construes the terms "adapted to" and "configured to" as "constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic."

Ex. 2105 at 16.

- Patent Owner submits the claim construction of the term "configured to" or "adapted to" is "an apparatus constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic."

"Configured To" / "Adapted to"

- The civil court determined, and the Federal Circuit agreed, that the inventor had limited the scope of the invention to an apparatus constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic:



traffic at a rate of speed which is comparable to the speed of the traffic . . ."). Generally, a court should not import limitations from the specification into the claims absent a clear indication that the patentee intended that the claims should be so limited. See Dealertrack, 674 F.3d at 1327; Hill-Rom Servs., 755 F.3d at 1372. But, here, the specification is describing the system as a whole according to the invention and not simply a preferred embodiment.[5] The Federal Circuit has explained: "When a patentee describes the features of the present invention as a whole, he alerts the reader that this description limits the scope of the invention." Pacing Techs., LLC v. Garmin Int'l, Inc., 778 F.3d 1021, 1025 (Fed. Cir. 2015) (internal quotation marks omitted)); accord Regents of Univ. of Minnesota v. AGA Med. Corp., 717 F.3d 929, 936 (Fed. Cir. 2013). Accordingly, the Court agrees with

Ex. 2105 at 14-15.

"Configured To" / "Adapted to"

- Even though the preamble is not used as antecedent basis for the claim elements, the entire patent must be analyzed to determine if the claims should be limited by the preamble.
    - *Applied Materials, Inc. v. Advanced Semiconductor Materials Am., Inc.*, 98 F.3d 1563, 1572–73 (Fed. Cir. 1996) (whether the preamble constitutes a limitation "is determined on the facts of each case in light of the overall form of the claim, and the invention as described in the specification and illuminated in the prosecution history").

"Configured To" / "Adapted to"

- The preamble may be considered necessary to give life, meaning, and vitality to the claims. *See Kropa v. Robie*, 187 F.2d 150, 152 (1951).

> "If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is necessary to give life, meaning, and vitality to the claim, then the claim preamble should be construed as if in the balance of the claim."

Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305 (Fed. Cir. 1999).

- This is what the civil court determined in its analysis. Patent Owner submits the proper claim construction for "configured to" is "constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic."

"Mobile Device" / "Mobile Unit"

- plain and ordinary meaning of "mobile device" / "mobile unit":
  - "a device that must register with and be able to directly communicate with the cellular network"
- the Carucel Patents relate to and describe as a whole improving the wireless connections of **MOBILE DEVICES WITHIN CELLULAR TELEPHONE SYSTEMS** via a moving base and should be limited as such.
- Patent Owner's construction seeks nothing more than "the construction that most accurately delineates the scope of the claimed invention." *PPC Broadband, Inc. v. Corning Optical Comm'ns RF, LLC*, 815 F.3d 734, 740-42 (Fed. Cir. 2016).

"Mobile Device" / "Mobile Unit"

- A mobile device is more than just a cordless phone handset.
  - A cordless phone can only communicate with its base station;
  - A cordless phone does not have the capability to directly communicate with the cellular network.
- The specifications of the Carucel Patents teach that a mobile device must be capable of directly communicating with a fixed cellular base station and a moving base station:

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,700, which is a continuation of application No. 09/400,594, filed on Sep. 22, 1999, now Pat. No. 7,221,908, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 25, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/02037, filed on Jan. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)
(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

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5,260,968 A * 11/1993 Gardner et al. 375/347
5,282,229 A * 1/1994 Yokev et al. 455/465
5,384,824 A * 1/1995 Alvesalo 455/456.2
5,404,570 A * 4/1995 Chiara et al. 455/22
5,603,080 A * 2/1997 Kallander et al. 455/34

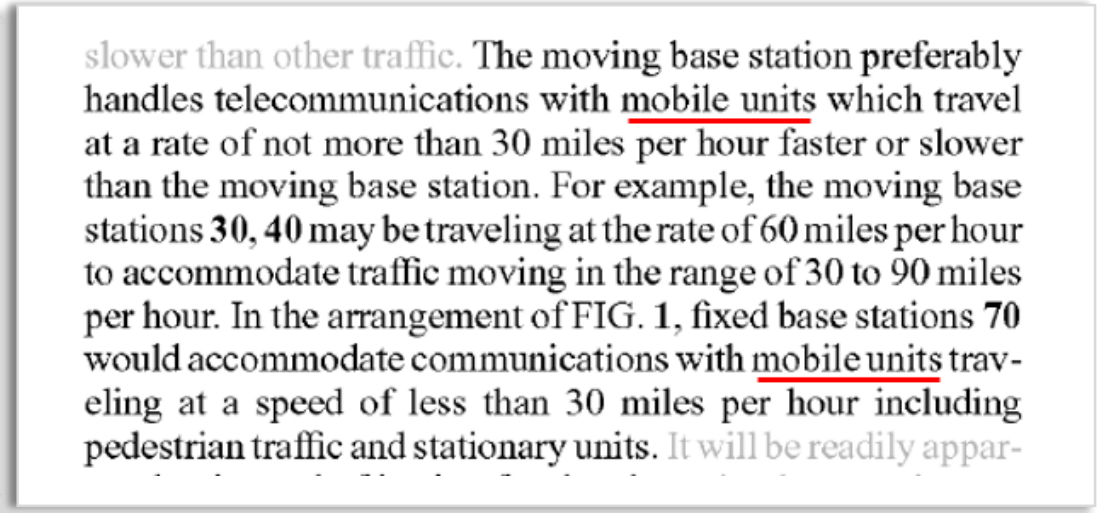
* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey LLP; Charles D Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

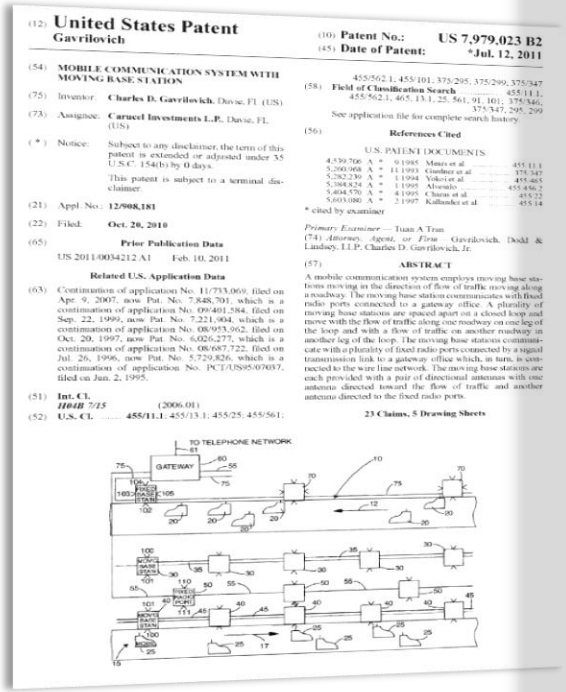


slower than other traffic. The moving base station preferably handles telecommunications with mobile units which travel at a rate of not more than 30 miles per hour faster or slower than the moving base station. For example, the moving base stations **30**, **40** may be traveling at the rate of 60 miles per hour to accommodate traffic moving in the range of 30 to 90 miles per hour. In the arrangement of FIG. **1**, fixed base stations **70** would accommodate communications with mobile units traveling at a speed of less than 30 miles per hour including pedestrian traffic and stationary units. It will be readily appar-

'023 Patent, Ex. 1001, 4:42-51.

"Mobile Device" / "Mobile Unit"

- The mobile device's capability to be switched back-and-forth between either a direct connection with the fixed base station or a connection with a moving base station is discussed repeatedly and throughout the specifications:



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1; 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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5,200,968	A *	11/1993	Gardner et al.	375/347
5,282,230	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvarado	455/456.2
5,404,570	A *	4/1995	Chiou et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

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23 Claims, 5 Drawing Sheets

base stations having the same identity code. The operation of the fixed base stations **70** is essentially the same as that of a standard fixed base station. In congested traffic areas, a mobile unit which is stopped or slowly moving, e.g., less than 30 miles per hour, will preferably be serviced by one of the fixed base stations **70**. As the speed of travel of the mobile unit **20** increases, a handoff will occur between the fixed base station and a moving base station. The procedures for determining whether a mobile unit is to be served by a fixed base station or a moving base station are the same procedures as described earlier herein in determining which moving base station is selected to serve a mobile unit, i.e., based on signal strength and error rate. Thus, when a call involving a mobile unit is initiated or when it is determined that a handoff should occur, the mobile unit may be handed from a moving station to a fixed station, or vice versa. Each mobile unit monitors

'023 Patent, Ex. 1001, 10:63-11:11.

"Mobile Device" / "Mobile Unit"

- The specifications teach that a mobile device MUST be capable of registering with a cellular network so it is able to receive calls coming from the cellular network:

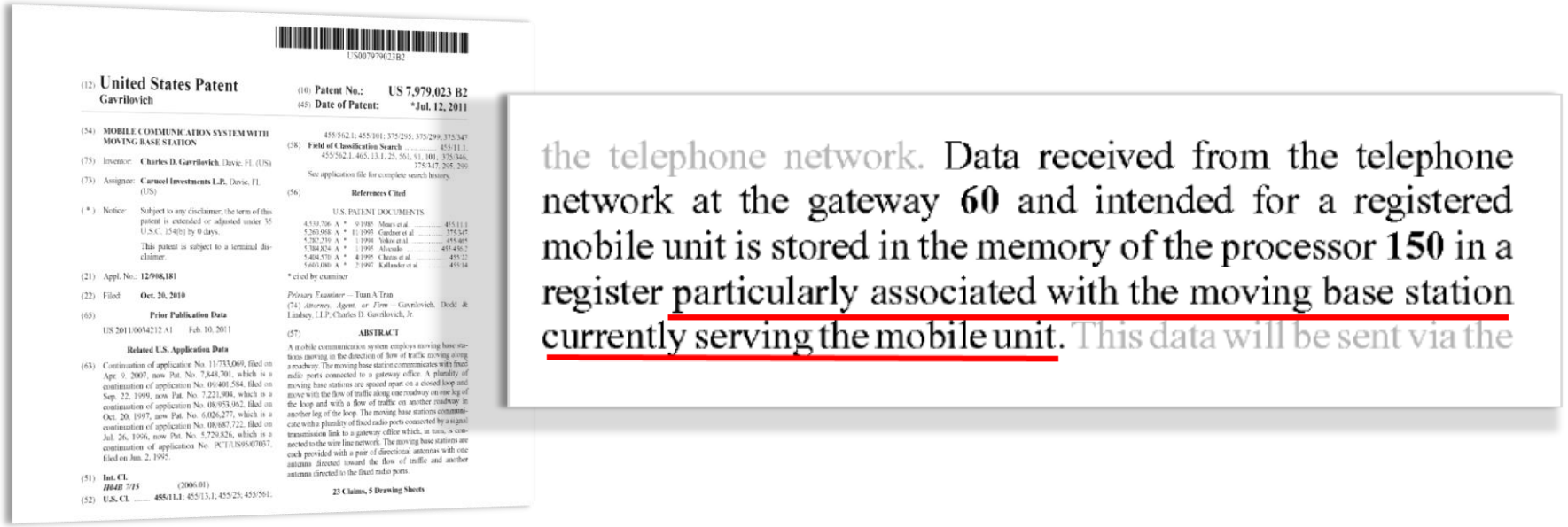
> When a mobile unit set is first powered up or first enters a service area, the mobile unit must register in the manner described earlier, by transmitting its unique address in the new service area. The address will be received by the closest moving base station **30** and transmitted via a fixed radio port and the gateway switch **60** to the telephone network. This registration procedure is required so that an incoming call for the mobile unit can be appropriately directed.

'023 Patent,
Ex. 1001, 9:62-10:2.

- In contrast, a cordless phone is only connected to its one base station; a cordless phone does not "register" with the cellular network as required by the specification of the '023 Patent.

"Mobile Device" / "Mobile Unit"

- The specifications teach that a mobile device must be capable of communicating with multiple moving base stations:



US007979023B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history.

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4,530,706	A *	9/1985	Mears et al.	455/11.1
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5,384,824	A *	1/1995	Alvesalo	455/456.5
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/34

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Primary Examiner — Tuan A Tran
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23 Claims, 5 Drawing Sheets

the telephone network. Data received from the telephone network at the gateway **60** and intended for a registered mobile unit is stored in the memory of the processor **150** in a register particularly associated with the moving base station currently serving the mobile unit. This data will be sent via the

'023 Patent, Ex. 1001, 10:34-38.

- While a cordless phone is tied directly to its one base station, a mobile device in the context of the Carucel Patents can be connected to different moving base stations when needed.

"Mobile Device" / "Mobile Unit"

A disputed term should be construed by first examining the intrinsic evidence of record from the perspective of one skilled in the relevant art.

Within the class of intrinsic evidence, "the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term."

Phillips v. AWH Corp., 415 F.3d 1303,1313-15 (Fed. Cir. 2005).

"Mobile Device" / "Mobile Unit"

- The description of the mobile device in the specifications of the Carucel Patents is dispositive.

- A mobile device:

  - must be able to directly communicate with the cellular network,

  - must be able to communicate with the cellular network indirectly by communicating with a moving base station,

  - must be able to register with the cellular network and,

  - must be able to move freely between mobile base stations.

"Mobile Device" / "Mobile Unit"

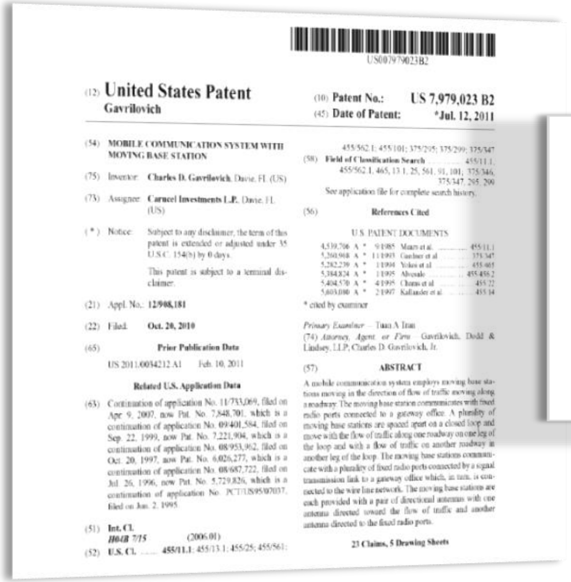
> Federal Circuit precedent forbids an overly broad interpretation of the claims "[w]hen a patentee describes the features of the present invention as a whole, he alerts the reader that this description limits the scope of the invention."

Pacing Techs., LLC v. Garmin Int'l, Inc., 778 F.3d 1021, 1025 (Fed. Cir. 2015).

- In a prior civil action involving the Carucel Patents, the district court concluded that the specification of the '904 Patent (one of the Carucel Patents) was "describing the system as a whole according to the invention and not simply a preferred embodiment."

"Mobile Device" / "Mobile Unit"

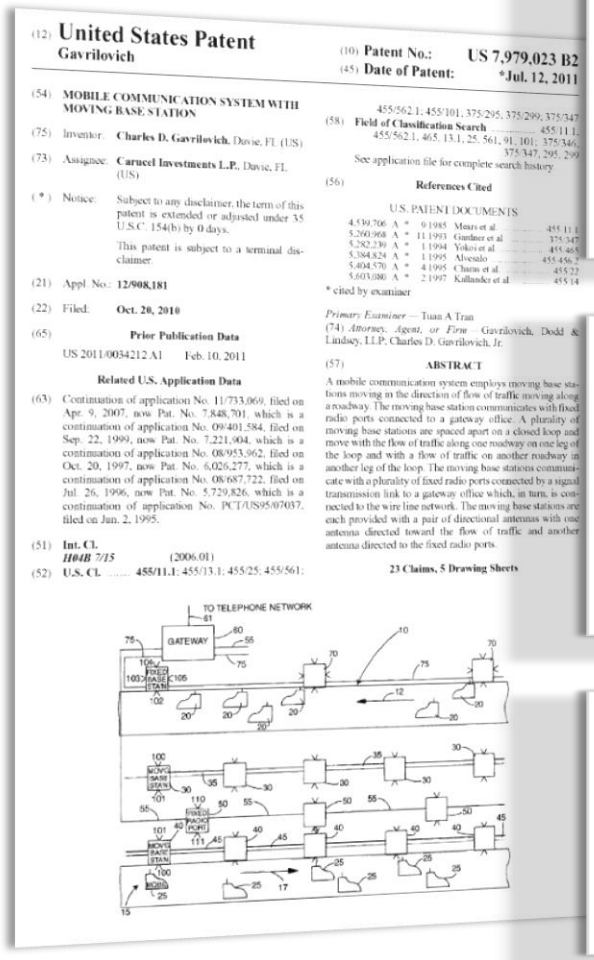
- The specifications of all instituted Carucel patents describe the invention as a whole and should be limited as such.
- Specifically, the Carucel Patents relate to and describe as a whole improving the wireless connections of mobile devices within cellular telephone systems via a moving base station—which is consistent with Patent Owner's construction of the term "mobile device":



> The invention relates to cellular telephone systems in which a mobile unit communicates by wireless communication to a base station connected to the wire telephone network and more particularly to cellular telephone systems adapted for use with fast-moving mobile units.

'023 Patent,
Ex. 1001, 1:19-23.

"Mobile Device" / "Mobile Unit"



(12) **United States Patent**
Gavrilovich

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(45) **Date of Patent: *Jul. 12, 2011**

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(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295, 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465.13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706	A *	9/1985	Mears et al.	455/11.1
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5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

In a typical cellular telephone system, an area is divided into a plurality of cells with each cell having a centrally located cell site. A mobile unit moving in such a cellular network communicates by radio with a nearest cell site. The

'023 Patent, Ex. 1001, 1:27-30.

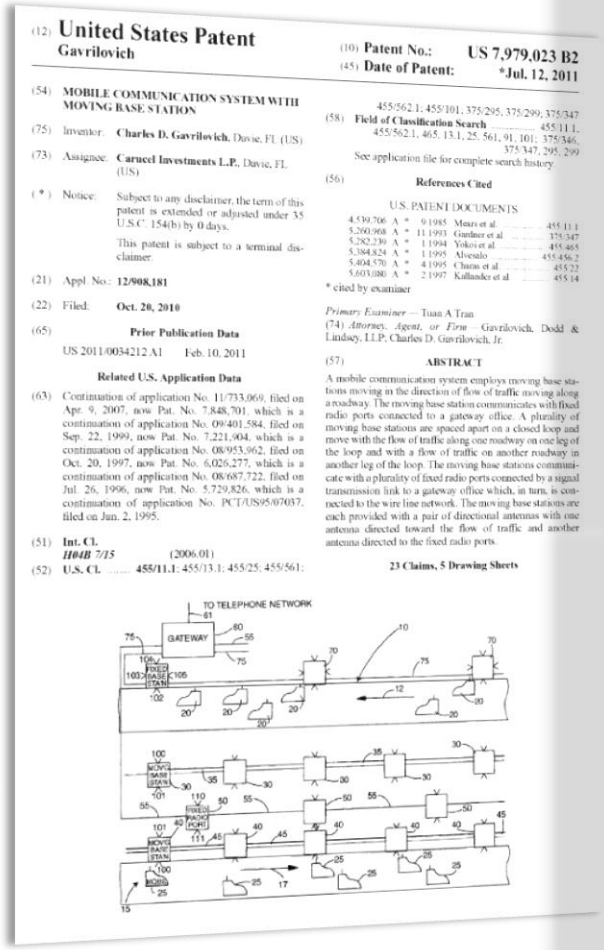
A problem with existing mobile telephone systems is the considerable time required in handoffs. This becomes a particular problem in urban areas which are highly congested. A basic principle of cellular telephone systems is the concept of frequency reuse. It can be shown that traffic capacity of a

'023 Patent, Ex. 1001, 1:56-60.

These and other problems of the prior art are overcome in accordance with this invention by means of a moving base station which is interposed between a moving mobile telephone unit and a fixed base station. In accordance with this

'023 Patent, Ex. 1001, 2:67-3:2.

"Mobile Device" / "Mobile Unit"



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

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23 Claims, 5 Drawing Sheets

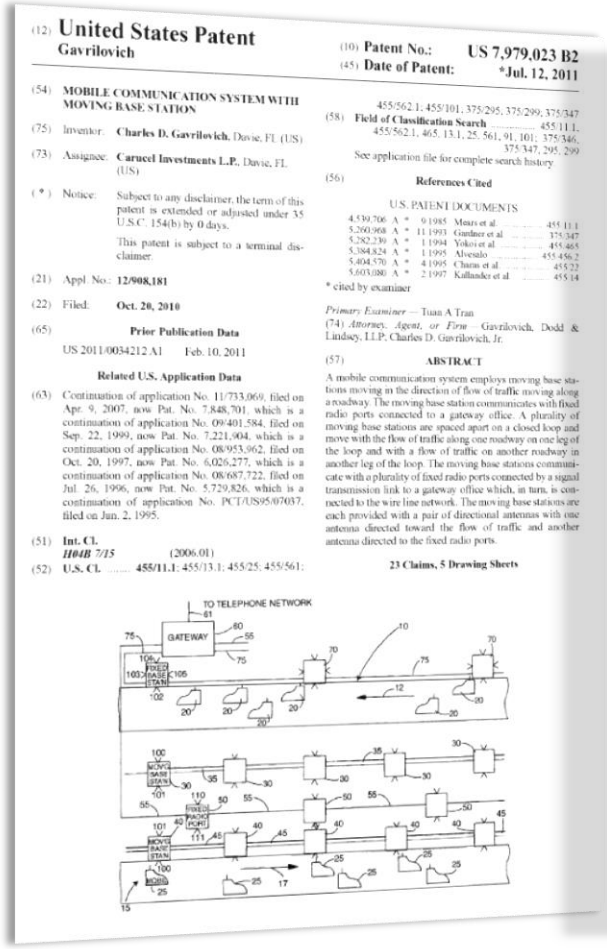
slower than other traffic. The moving base station preferably handles telecommunications with mobile units which travel at a rate of not more than 30 miles per hour faster or slower than the moving base station. For example, the moving base stations **30**, **40** may be traveling at the rate of 60 miles per hour to accommodate traffic moving in the range of 30 to 90 miles per hour. In the arrangement of FIG. **1**, fixed base stations **70** would accommodate communications with mobile units traveling at a speed of less than 30 miles per hour including pedestrian traffic and stationary units. It will be readily appar-

'023 Patent, Ex. 1001, 4:42-51.

When a mobile unit set is first powered up or first enters a service area, the mobile unit must register in the manner described earlier, by transmitting its unique address in the new service area. The address will be received by the closest moving base station **30** and transmitted via a fixed radio port and the gateway switch **60** to the telephone network. This registration procedure is required so that an incoming call for the mobile unit can be appropriately directed.

'023 Patent, Ex. 1001, 9:62-10:2.

"Mobile Device" / "Mobile Unit"



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(58) **Field of Classification Search** 455/11.1, 455/562.1, 465.13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
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A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

base stations having the same identity code. The operation of the fixed base stations **70** is essentially the same as that of a standard fixed base station. In congested traffic areas, a mobile unit which is stopped or slowly moving, e.g., less than 30 miles per hour, will preferably be serviced by one of the fixed base stations **70**. As the speed of travel of the mobile unit **20** increases, a handoff will occur between the fixed base station and a moving base station. The procedures for determining whether a mobile unit is to be served by a fixed base station or a moving base station are the same procedures as described earlier herein in determining which moving base station is selected to serve a mobile unit, i.e., based on signal strength and error rate. Thus, when a call involving a mobile unit is initiated or when it is determined that a handoff should occur, the mobile unit may be handed from a moving station to a fixed station, or vice versa. Each mobile unit monitors

'023 Patent,
Ex. 1001, 10:63-11:11.

"Mobile Device" / "Mobile Unit"

- Petitioners contend that statements in the intrinsic record must rise to the level of a disclaimer in order to inform the meaning of the disputed claim term.
- Federal Circuit precedent cautions against Petitioner's flawed standard.
  - *Personalized Media Communications, LLC v. Apple Inc.*, 952 F.3d 1336, 1345-46 (Fed. Cir. Mar. 13, 2020) ("we conclude that the applicant's repeated and consistent statements during prosecution . . . are decisive as to the meaning of the disputed claim term—even if those statements do not rise to the level of a disclaimer.");
  - *Bell Atlantic Network Services, Inc. v. Covad Communications Group, Inc.*, 262 F.3d 1258, 1268-69, 1271 (Fed. Cir. 2001) ("[T]he written description can provide guidance as to the meaning of the claims . . . even if the guidance is not provided in explicit definitional format.").

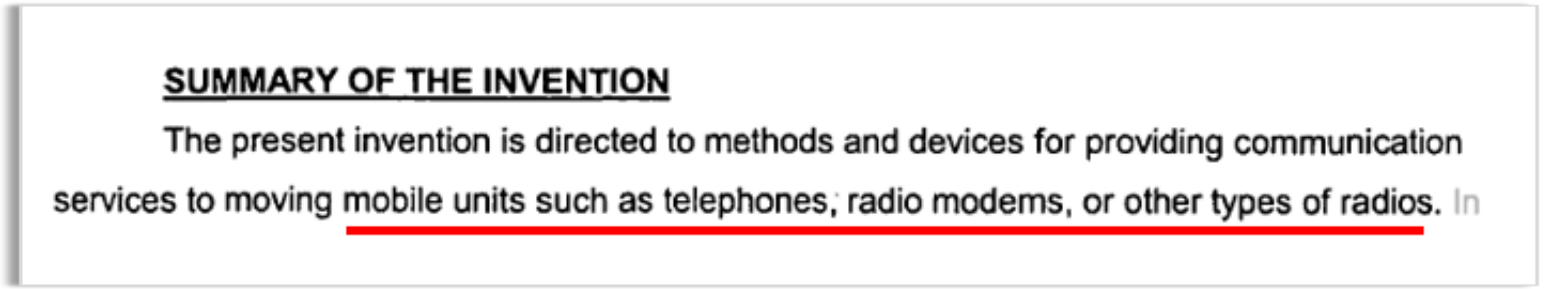
"Mobile Device" / "Mobile Unit"

- It is well established that "when the scope of the invention is clearly stated in the specification, and is described as the advantage and distinction of the invention, it is not necessary to disavow explicitly a different scope." *On Demand Mach. Corp. v. Ingram Indus.*, 442 F.3d 1331, 1340 (Fed. Cir. 2006).
    - For example, in *On Demand*, the Federal Circuit construed the claim term "customer" as the "retail customer" based on the specification explaining the advantages that the system provided to this type of customer, "repeatedly reinforc[ing]" its usage of the term "customer" as the retail customer. *On Demand Mach. Corp. v. Ingram Indus.*, 442 F.3d 1331, 1340 (Fed. Cir. 2006).

"Mobile Device" / "Mobile Unit"

- The Federal Circuit's analysis in *On Demand* is similar to the Patent Owner's claim construction.
- Here, the Carucel Patents are neither directed toward nor relate to improving the wireless connections of any "movable device capable of receiving and transmitting radio signals", as Petitioner proposes.
- In stark contrast, the Carucel Patents explicitly and exclusively relate to improving the wireless connections of mobile devices within "cellular telephone systems."

"Mobile Device" / "Mobile Unit"



SUMMARY OF THE INVENTION

The present invention is directed to methods and devices for providing communication services to moving mobile units such as telephones, radio modems, or other types of radios. In

Ex. 1023 at 181.

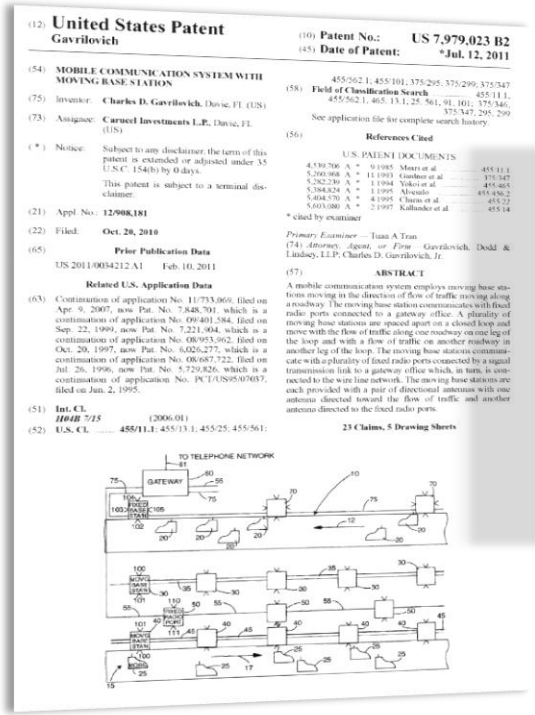
- Cellular phones, cellular modems, and hybrid cellular telephones that included both analog voice and digital data capability ("other types of radios") all meet the definition of "mobile device" as set forth by the Carucel Patents.
- Nothing in the "summary of the invention" portion of the appellant's appeal brief modified the definition of the term "mobile device" in the specification.

"Mobile Device" / "Mobile Unit"

- Petitioners failed to provide any Claim Construction evidence supporting their constructions, only attorney argument.
- The Board should not construe Mobile Device as Petitioners suggest, especially where only one party has provided substantial evidence that consistently and fully assesses the term "mobile device" that is "most accurately" consistent with the specification of the Carucel Patents. *PPC Broadband, Inc. v. Corning Optical Communs. RF, LLC*, 815 F.3d 734, 740-742 (Fed. Cir. 2016).
- Patent Owner submits that "mobile device" should properly be construed as "a device that must register with and be able to directly communicate with the cellular network."

"Automotive Vehicle"

- plain and ordinary meaning of this term is "automobile."
- The Carucel patents apply this plain meaning:



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

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H04B 7/15 (2006.01)

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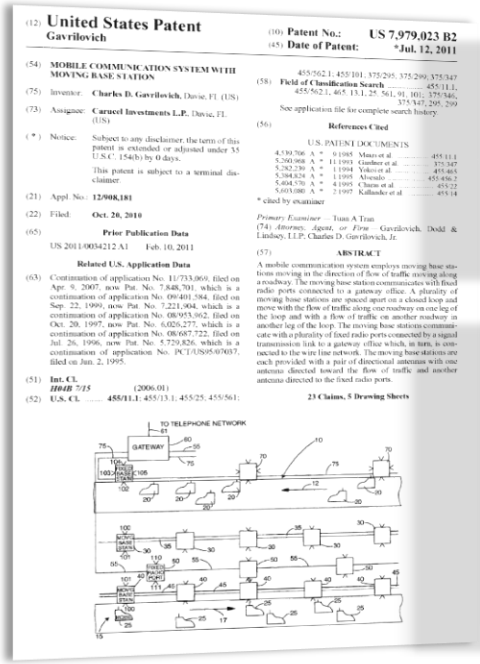
23 Claims, 5 Drawing Sheets

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**, as indicated by the arrow **12**.

'023 Patent, Ex. 1001, 4:6-10.

"Automotive Vehicle"

- An "automotive vehicle" must travel along the roadway as described in the specification of the Carucel Patents:



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23 Claims, 5 Drawing Sheets

> A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communi-

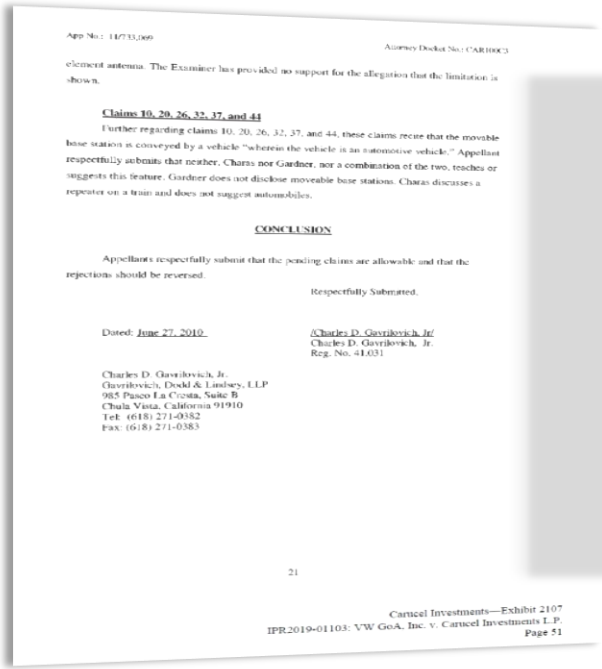
'023 Patent, Ex. 1001, Abstract.

- A person of ordinary skill in the art would understand the term "automotive vehicle" to mean an automobile.

"Automotive Vehicle"

The File History of the '701 Patent

- The Patent Owner stated that an "automotive vehicle" is an automobile in the file history of one of the Carucel Patents:



App No.: 11/733,069 Attorney Docket No.: CARHOC3

element antenna. The Examiner has provided no support for the allegation that the limitation is shown.

Claims 10, 20, 26, 32, 37, and 44

Further regarding claims 10, 20, 26, 32, 37, and 44, these claims recite that the movable base station is conveyed by a vehicle "wherein the vehicle is an automotive vehicle." Appellant respectfully submits that neither, Charas nor Gardner, nor a combination of the two, teaches or suggests this feature. Gardner does not disclose moveable base stations. Charas discusses a repeater on a train and does not suggest automobiles.

CONCLUSION

Appellants respectfully submit that the pending claims are allowable and that the rejections should be reversed.

Respectfully Submitted,

Dated: June 27, 2010

/Charles D. Gavrilovich, Jr/
Charles D. Gavrilovich, Jr.
Reg. No. 41,031

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Carucel Investments—Exhibit 2107
IPR2019-01103: VW GoA, Inc. v. Carucel Investments L.P.
Page 51

Claims 10, 20, 26, 32, 37, and 44

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Ex. 2107 at 51.

"Automotive Vehicle"

The File History of the '701 Patent

- In discussing the claim elements "wherein the vehicle is an automotive vehicle," the inventor stated the prior art reference, Charas, "does not suggest automobiles."
- The inventor, in distinguishing the prior art over the term "automotive vehicle," stated that the prior art does not "suggest automobiles"—thus confirming the definition as used in the specifications of the Carucel patents.
- This is a clear statement of intent by the inventor to equate "automotive vehicle" with "automobile."
- Patent Owner submits that "automotive vehicle" should properly be construed as "automobile."

"Automotive Vehicle"

- Patent Owner's proposed construction is consistent with the black-letter law:

> "[E]ven where prosecution history statements do not rise to the level of unmistakable disavowal, they do inform the claim construction."

Personalized Media Communs., LLC v. Apple Inc., 952 F.3d 1336, 1345-46 (Fed. Cir. 2020).

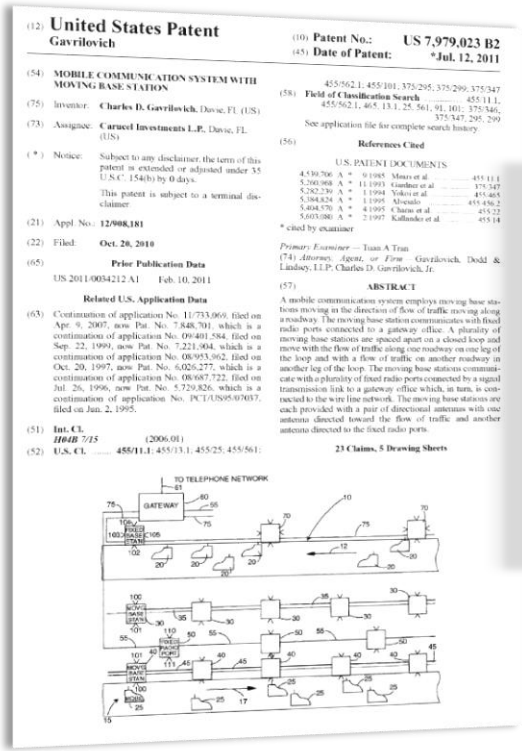
> "[P]rosecution history can inform the meaning of the claim language by demonstrating how the inventor understood the invention."

Kaken Pharmaceutical Co. v. Iancu, 952 F.3d 1346, 1353-54 (Fed. Cir. Mar. 13, 2020).

- Petitioner's proposed construction—"a vehicle moving by means of its own power"—would render the term "automotive vehicle" void, meaningless, and superfluous.

"Automotive Vehicle"

- The Carucel Patents provide an example of a vehicle ("by means of rail") while also providing an example of an "automotive vehicle" ("automotive vehicle traveling on the roadway"):



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706	A *	9/1985	Mears et al.	455/11.1
5,260,968	A *	11/1993	Gardner et al.	375/347
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5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

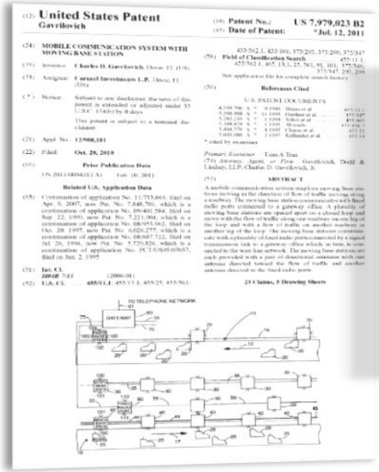
23 Claims, 5 Drawing Sheets

> 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**, as indicated by the arrow **12**.

'023 Patent, Ex. 1001, 4:6-10.

"Automotive Vehicle" ≠ moves by means of its own power

- Petitioner (VW GoA) proposes that "automotive vehicle" should be interpreted as a vehicle that "moves by means of its own power."
  - ➢ Under Petitioner's proposed construction, there is no longer a distinction between the claim terms "vehicle" and "automotive vehicle" when considering the claims and examples set forth in the specification because both examples are "vehicles" and certainly move by "means of [their] own power."



19. An apparatus in accordance with claim **11**, wherein the apparatus is conveyed by a vehicle.

20. An apparatus in accordance with claim **19**, wherein the vehicle is an automotive vehicle.

'023 Patent,
Ex. 1001, Claims 19 & 20.

"Automotive Vehicle"

> "The doctrine of claim differentiation provides a presumption that differently worded claims cover different claim scope."

Wi-LAN USA, Inc. v. Apple Inc., 830 F.3d 1374, 1391 (Fed. Cir. 2016).

- Even adding Gilhousen865's airplane into this analysis—as Petitioner proposes—would further render the term "automotive vehicle" superfluous for the same reasons.
- Petitioner's proposed construction cannot be the correct construction.

"Automotive Vehicle"

- Additionally, Petitioner seeks to make its case by asserting that "non-automotive vehicles" such as "wagons, strollers, trailers, bicycles" would satisfy "vehicle" without satisfying "automotive vehicle."
- Petitioner's argument is misguided because it fails to account for the Independent Claims that require the limitation of "configured to."
  - "wagons, strollers, trailers, and bicycles"—ALONE—"do[] not move with traffic" and "do[] not move with the traffic at a rate of speed which is comparable to the traffic", such as at the exemplary speed of 60mph set forth in the Carucel Patents:

> In operation, the moving base stations **30** may move in the direction of the flow of the traffic at a rate of, for example, 60 miles per hour, which may be faster than some traffic and slower than other traffic. The moving base station preferably

'023 Patent, Ex. 1001, 4:39-42.

Comparative Reliability of the Expert Opinions

- **Carucel's Expert – Mr. Mark Lanning**
  - Mr. Lanning offers support, credible evidence, and explanations for his conclusions within his Declaration.
  - 35 years of engineering experience in all the development life cycle phases for hardware and software products.
  - worked with both network operators and product suppliers regarding network architectures and product development and has acquired key insights into their perspectives and requirements as both suppliers and customers.
  - directly responsible for the design, development and rollout of new products that have earned combined revenues in excess of one billion dollars for their respective companies.
  - worked with Motorola, Sprint, Nextel, and British Telecom (BT) to roll out some of the most successful telecom applications and network expansions worldwide
  - directly involved in the design of Sprint's Common Channel Signaling System 7 (SS7) network and the design and rollout of its FON (calling card) and 800 number services.
  - program manager responsible for the design and rollout of BT's Advanced Cellular Network (ACN) that used AIN functionality.

Comparative Reliability of the Expert Opinions

- **<u>Unified's Expert – Dr. Vijay Madisetti</u>** (IPR2019-01079)
  - The Board should afford Dr. Madisetti's Declaration little weight as it fails to offer support, credible evidence, or explanations for his conclusions.
  - On at least two separate occasions, the Board has found Dr. Madisetti's opinions to be unsubstantiated.
    - *ZTE Corp. v. Interdigital Tech. Corp.*, IPR2014-00275 (PTAB July 7, 2014)("Likewise, Dr. Madisetti, does not provide sufficient and persuasive evidence demonstrating that a person of ordinary skill in the art would have understood . . . .").
    - *Blackberry Corp. v. Mobilemedia Ideas, LLC*, IPR2013-00036 (PTAB March 7, 2014) ("We do not credit the testimony of Dr. Madisetti, that one skilled in the art at the time of the invention of the '048 patent would understand . . . .").
  - Dr. Madisetti describes his background as "wireless communications, digital signal processing, integrated circuit design (analog & digital), software engineering, system-level design methologies and tools, and software systems." Ex. 1009, ¶ 9.

Comparative Reliability of the Expert Opinions

- **VW GoA's Expert – Dr. Zhi Ding** (IPR2019-01101 & IPR2019-01105)
  - Limited hands-on cellular systems experience.
  - Never developed or been involved in the production or building of a cellular base station nor has he ever built or assisted in the building of a mobile device for a cellular network. *See* Ex. 2108 at 103:22-104:17; 104:24-105:11.
  - Experience is more limited to various aspects of signal processing, speech processing and communications. *See* Ex. 2108 at 105:1-23.
- **VW GoA's Expert – Mr. Scott Denning** (IPR2019-01102 & IPR2019-01103)
  - Limited cellular systems experience.
  - Never actually developed a cellular base station. *See* Ex. 2108 at 18:7-9.
  - The only generation of cellular technology he ever had hands on experience with was analog cellular systems. *See* Ex. 2108 at 19:8-13; 20:5-9.
  - The only recent experience has been in the patent litigation support area. *See* Ex. 1004.

Unified Patents Inc.

Petitioner

v.

Carucel Investments, L.P.

Patent Owner

Case No. IPR2019-01079

U.S. Patent No. 7,979,023

Unified's Patentability Challenges of the '023 Patent

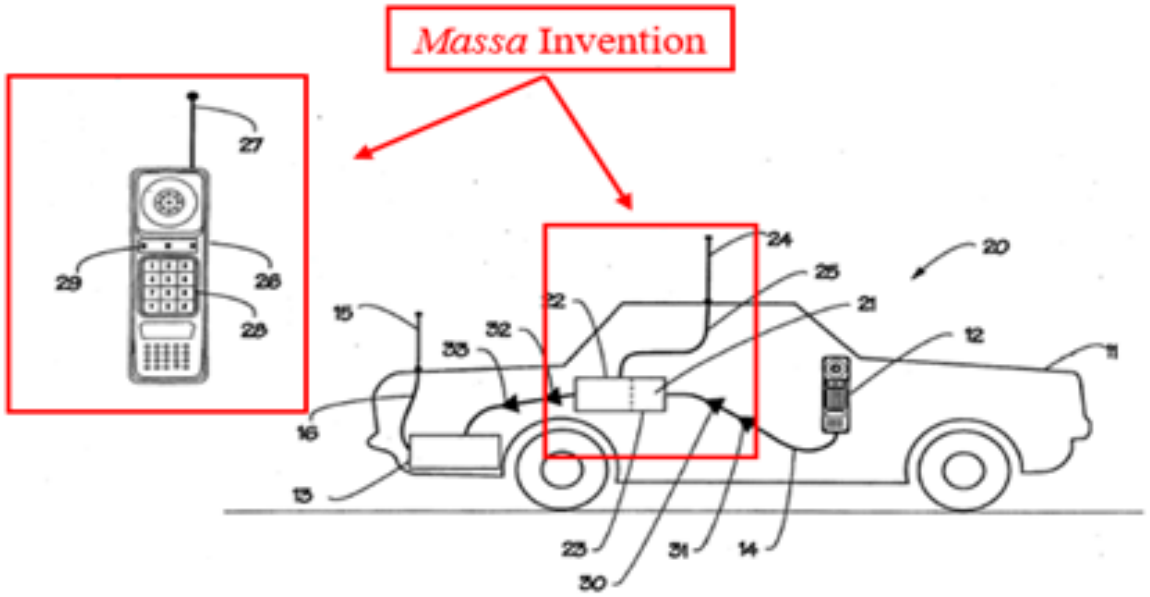
Ground	References	Basis	Claims Challenged
1	*Massa and Vogel*	§ 103	1, 11, and 19–21
2	*Massa, Vogel, and Toshiba*	§ 103	16 and 18
3	*Massa, Vogel, and Padovani*	§ 103	17, 21, 22, and 23
4	*Thrower and Kaewell*	§ 103	1, 11, 16, and 18–20
5	*Thrower, Kaewell, and Blakeney*	§ 103	17 and 21–23

Petitioner's First Primary Reference – *Massa*

- *Massa* is directed towards improving the convenience of handsets of radio telephones commonly installed in motor vehicles.
- *Massa* is not directed toward improving either "transportable radio telephones" or "hand-held cellular phones."
  - *Massa* does not disclose that either "transportable radio telephones" or "hand-held cellular phones" are interchangeable with Massa's improvement to handsets for the radio telephones installed in motor vehicles.

Petitioner's First Primary Reference – *Massa*

- The invention of *Massa* is an accessory [adapter unit (23)] installed between the transceiver (13) of the prior art vehicle-mounted radio telephone system and the handset (12) of the prior art vehicle-mounted radio telephone system to provide a wireless connection between the accessory [adapter unit (23)] and the cordless handset (26).



Ex. 1003, Figure 2 (Annotated).

Petitioner's First Primary Reference – *Massa*

- The invention of *Massa* is merely replacing a corded handset with a cordless handset that operates at frequencies outside of the cellular range.

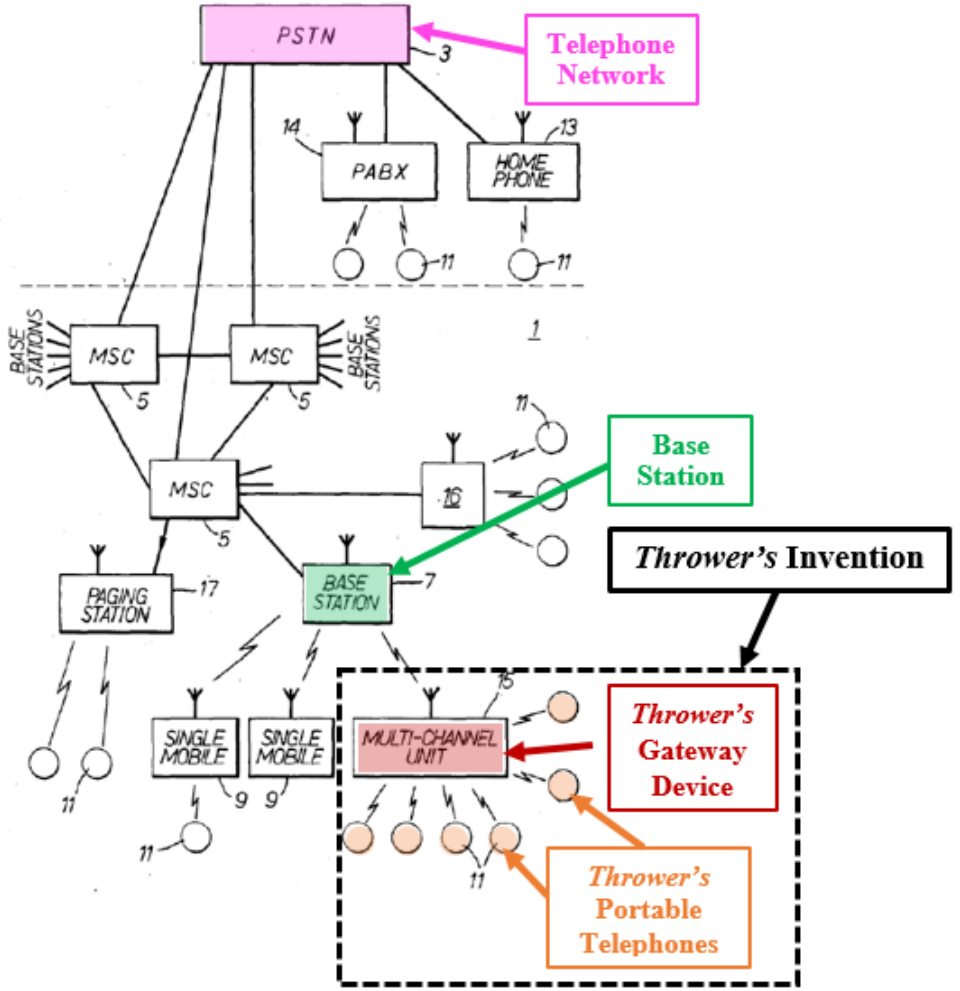
- Because the cordless handset operates at frequencies outside of the cellular range, it cannot register with or directly communicate with the cellular network.

Petitioner's Second Primary Reference – *Thrower*

- *Thrower* is directed towards to overcoming the identified specific issues that existed with the prior art mobile radio telephone units:
  - its requirement of "perform[ing] complex procedures in order to register with its closest base station"; and
  - its requirement of "complex and expensive" equipment.
- To overcome these shortcomings, *Thrower* implemented its overlay communication system made up of an array of gateway devices.
  - *Thrower's* gateway devices allow *Thrower's* portable telephones (11) to communicate with a base station (7) via the gateway device (15) rather than directly to the base station.

Petitioner's Second Primary Reference – *Thrower*

- Because the portable telephones (11) only communicate to the base stations (7) via the gateway devices (9) and (13-17) these portable phones cannot register with or directly communicate with the cellular network (3).



Ex. 1010, Figure 1 (annotated).

Primary Reasons Carucel Should Prevail

- No motivation to combine Petitioner's prior art references
  - Petitioner's proposed combinations result in inoperable devices.
- Ground 1
  - *Massa* and *Vogel* do not disclose "A Mobile Device" Required by Claim 11.
  - Neither *Massa* Nor *Vogel* disclose a moving "receiver configured to receive fixed port signals . . . through the plurality of spatially separated antennas" required by Claim 11.

Primary Reasons Carucel Should Prevail

- Ground 2
  - Neither *Massa* Nor *Toshiba* disclose "signals received through the spatially separated antenna" required by Claim 16.
  - Neither *Massa* Nor *Toshiba* disclose "a controller configured . . . to select a best signal" required by Claim 16.
- Ground 3
  - *Massa*, *Vogel*, and *Padovani* fail to disclose "common data" required by Claim 22.
  - *Massa*, *Vogel*, and *Padovani* fail to disclose "wherein transmission of each fixed port signal from each of the plurality of fixed ports is delayed by a different time" required by Claim 23.

Primary Reasons Carucel Should Prevail

- Ground 4
  - *Thrower* and *Kaewell* Do Not Disclose "A Mobile Device" As Required by Independent Claim 11.
- Ground 5
  - *Thrower*, *Kaewell*, and *Blakeney* fail to disclose "A Mobile Device" As Required by Claims 21 – 23.
  - *Thrower*, *Kaewell*, and *Blakeney* fail to disclose "common data" required by Claim 22.
  - *Thrower*, *Kaewell*, and *Blakeney* fail to disclose "wherein transmission of each fixed port signal from each of the plurality of fixed ports is delayed by a different time" required by Claim 23.

No Motivation to Combine the Asserted Prior Art References

Grounds 1 – 3: *Massa* with *Vogel*

- Petitioner's Proposed combination of *Massa* with *Vogel* for Grounds 1-3 would result in an inoperable device.
  - Incorporating the spatially separated antennas of *Vogel* into *Massa's* moving transceiver moving communal unit results in an inoperable device.
  - the antenna processing teachings of *Vogel* will not work if the spatially separated antennas are located on the moving transceiver of *Massa*, as Petitioner proposes.

Grounds 1 – 3: *Massa* with *Vogel*

Testimony of Carucel's Expert

teachings of *Vogel* into Petitioner's proposed combination. As I discussed above in Section VIII.B, neither of Vogel's processing methods of time delay will work where Vogel's spatially separated antennas are employed on the moving transceiver of Massa, as Petitioner and Dr. Madisetti propose. This is because the moving transceiver will cause the received time delay (that occurs from when the signal is first transmitted from the base station to when the signal is received at the moving transceiver through its spatially separated antennas) to be constantly changing, which results in any delay value stored at the moving transceiver to be wrong. Therefore, if this incorrect delay value is used by the moving transceiver for a subsequent transmission to the base station, the base station will not have received the two transmitted signals to constructively superimpose the signals upon each other to improve the receiving quality.

IPR2019-01079, Ex. 2100 at ¶ 136.

No Motivation to Combine the Asserted Prior Art References

McGinley v. Franklin Sports, Inc.

"If references taken in combination would produce a 'seemingly inoperative device,' such references teach away from the combination and thus cannot serve as predicates for a *prima facie* case of obviousness."

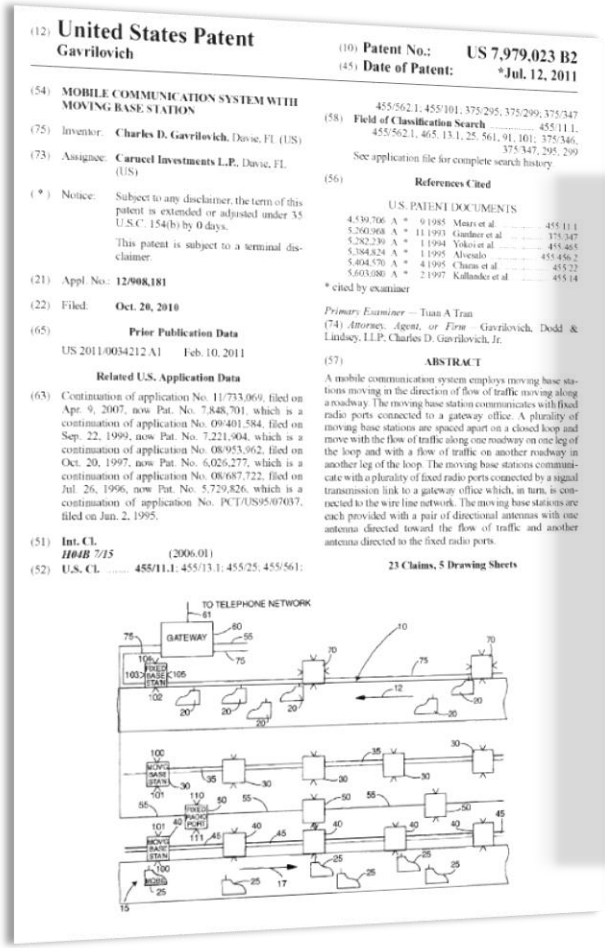
McGinley v. Franklin Sports, Inc., 262 F.3d 1339, 1354 (Fed. Cir. 2001).

No Motivation to Combine the Asserted Prior Art References

Grounds 4 – 5: *Thrower* with *Kaewell*

- Petitioner's Proposed combination of *Thrower* with *Kaewell* for Grounds 4-5 would result in an inoperable device.
  - ➢ adding the spatially separated antennas of *Kaewell* (16 & 18) into *Thrower's* moving communal unit (15) results in a device that cannot receive signals because *Thrower* does not teach how to process multiple receive signal input paths received from the separated antennas.
- Petitioner's Proposed combination would also require much new circuitry not disclosed in either *Thrower* or *Kaewell*.

Ground 1: *Massa* with *Vogel*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(51) **Int. Cl.**
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(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
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Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Independent Claim 11

11. An apparatus configured to move relative to Earth, the apparatus comprising:

a plurality of spatially separated antennas; and

a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas; and

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

Ex. 1001, Claim 11.

Ground 1: Claim 11 – "through the plurality of spatially separated antennas"

- *Massa* and *Vogel* do not disclose or render obvious this limitation because the use of *Vogel's* spatially separated antennas on *Massa's* moving transceiver results in an inoperable device.
  - *Massa* does not disclose how to process multiple receive signal input paths received from the separated antennas;
  - *Vogel* does not disclose how to implement its invention on any moving transceiver; and
  - *Vogel's* antenna processing teachings regarding time delay will not work if its spatially separated antennas are located on *Massa's* moving transceiver.

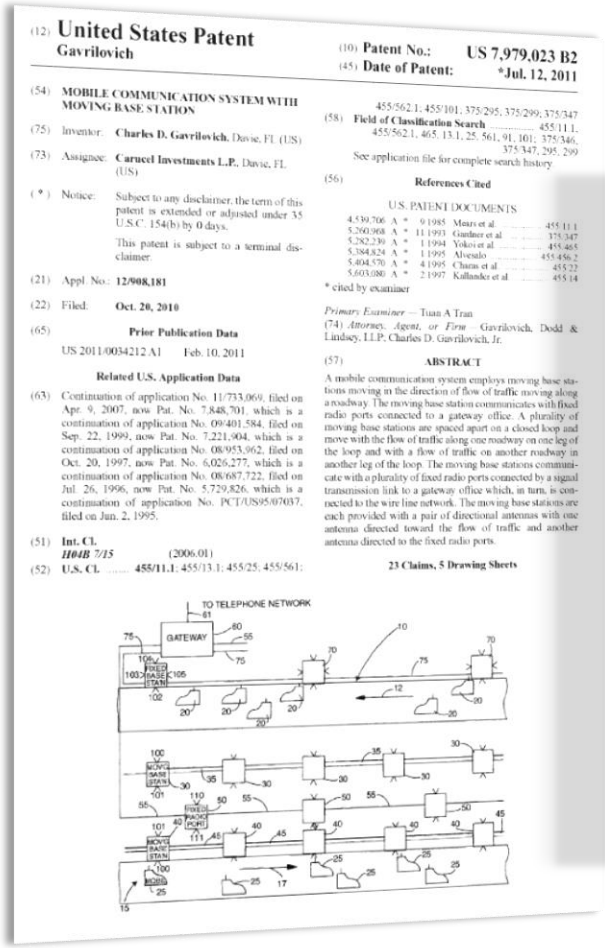
Ground 1: Claim 11 – This Issue Cannot be Solved by Applying the Processing Teachings of *Vogel*

Testimony of Carucel's Expert

teachings of *Vogel* into Petitioner's proposed combination. As I discussed above in Section VIII.B, neither of Vogel's processing methods of time delay will work where Vogel's spatially separated antennas are employed on the moving transceiver of Massa, as Petitioner and Dr. Madisetti propose. This is because the moving transceiver will cause the received time delay (that occurs from when the signal is first transmitted from the base station to when the signal is received at the moving transceiver through its spatially separated antennas) to be constantly changing, which results in any delay value stored at the moving transceiver to be wrong. Therefore, if this incorrect delay value is used by the moving transceiver for a subsequent transmission to the base station, the base station will not have received the two transmitted signals to constructively superimpose the signals upon each other to improve the receiving quality.

Ex. 2100 at ¶ 136.

Ground 1: *Massa* with *Vogel*



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(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

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(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Independent Claim 11

11. An apparatus configured to move relative to Earth, the apparatus comprising:

a plurality of spatially separated antennas; and

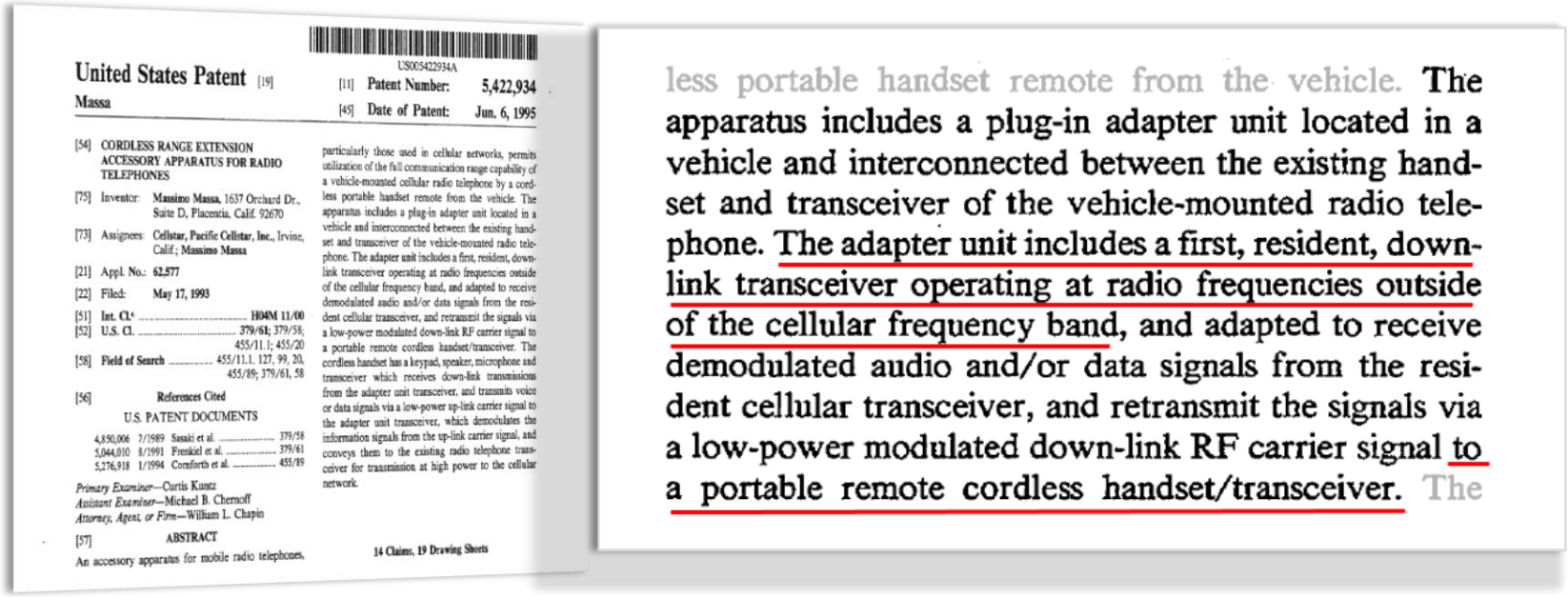
a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas; and

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

Ex. 1001, Claim 11.

Ground 1: Claim 11 – "A Mobile Device"

- *Massa* and *Vogel* do not disclose or render obvious "a mobile device" in the context of the entire '023 Patent.
- Instead, *Massa* only discloses a portable cordless handset that operates at frequencies outside of the cellular range:



US005422934A

United States Patent [19]
Massa

[11] **Patent Number:** 5,422,934
[45] **Date of Patent:** Jun. 6, 1995

[54] **CORDLESS RANGE EXTENSION ACCESSORY APPARATUS FOR RADIO TELEPHONES**

[75] Inventor: **Massimo Massa**, 1637 Orchard Dr., Suite D, Placentia, Calif. 92670

[73] Assignees: **Cellstar, Pacific Cellstar, Inc.**, Irvine, Calif.; **Massimo Massa**

[21] Appl. No.: **62,577**

[22] Filed: **May 17, 1993**

[51] Int. Cl.[6] H04M 11/00
[52] U.S. Cl. 379/61; 379/58; 455/11.1; 455/20
[58] Field of Search 455/11.1, 127, 99, 20, 455/89; 379/61, 58

[56] References Cited
U.S. PATENT DOCUMENTS

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5,044,010	8/1991	Frenkiel et al.	379/61
5,276,918	1/1994	Comforth et al.	455/89

Primary Examiner—Curtis Kuntz
Assistant Examiner—Michael B. Chernoff
Attorney, Agent, or Firm—William L. Chapin

[57] **ABSTRACT**

An accessory apparatus for mobile radio telephones, particularly those used in cellular networks, permits utilization of the full communication range capability of a vehicle-mounted cellular radio telephone by a cordless portable handset remote from the vehicle. The apparatus includes a plug-in adapter unit located in a vehicle and interconnected between the existing handset and transceiver of the vehicle-mounted radio telephone. The adapter unit includes a first, resident, down-link transceiver operating at radio frequencies outside of the cellular frequency band, and adapted to receive demodulated audio and/or data signals from the resident cellular transceiver, and retransmit the signals via a low-power modulated down-link RF carrier signal to a portable remote cordless handset/transceiver. The cordless handset has a keypad, speaker, microphone and transceiver which receives down-link transmissions from the adapter unit transceiver, and transmits voice or data signals via a low-power up-link carrier signal to the adapter unit transceiver, which demodulates the information signals from the up-link carrier signal, and conveys them to the existing radio telephone transceiver for transmission at high power to the cellular network.

14 Claims, 19 Drawing Sheets

less portable handset remote from the vehicle. **The apparatus includes a plug-in adapter unit located in a vehicle and interconnected between the existing handset and transceiver of the vehicle-mounted radio telephone. The adapter unit includes a first, resident, down-link transceiver operating at radio frequencies outside of the cellular frequency band, and adapted to receive demodulated audio and/or data signals from the resident cellular transceiver, and retransmit the signals via a low-power modulated down-link RF carrier signal to a portable remote cordless handset/transceiver.** The

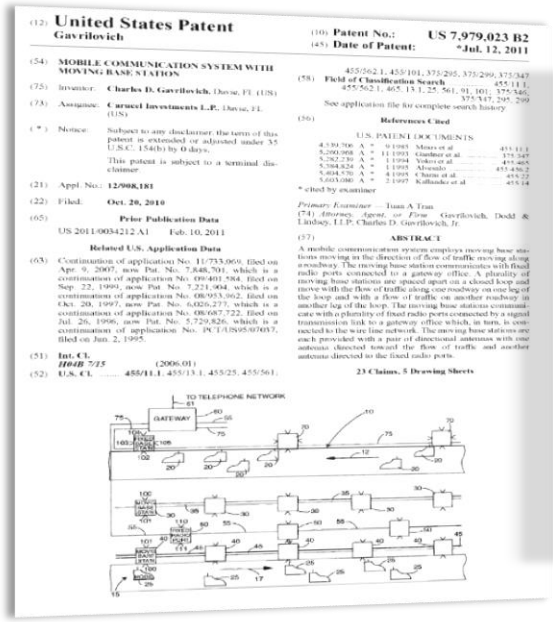
Ex. 1003, Abstract.

Ground 1: Claim 11 – "A Mobile Device"

- Since *Massa's* portable handset operates at frequencies outside of the cellular range, *Massa's* portable cordless handset does not have any cellular telephone capability:
  - *Massa's* portable handset is not capable of directly communicating with a fixed cellular base station; and
  - *Massa's* portable handset is not capable of registering with a cellular network.

Ground 1: *Massa* with *Vogel*

Dependent Claims 19, 20, and 21



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

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(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,362, filed on Oct. 20, 1997, now Pat. No. 6,026,273, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561;

455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1; 455/562.1; 465; 13.1; 25; 561; 91; 101; 375/346; 375/347; 295; 299

See application file for complete search history.

(56) **References Cited**

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5,394,424 A *	11/1995	Alvesalo	455/456.2
5,404,570 A *	4/1995	Chiba et al.	455/22
5,603,086 A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

19. An apparatus in accordance with claim **11**, wherein the apparatus is conveyed by a vehicle.

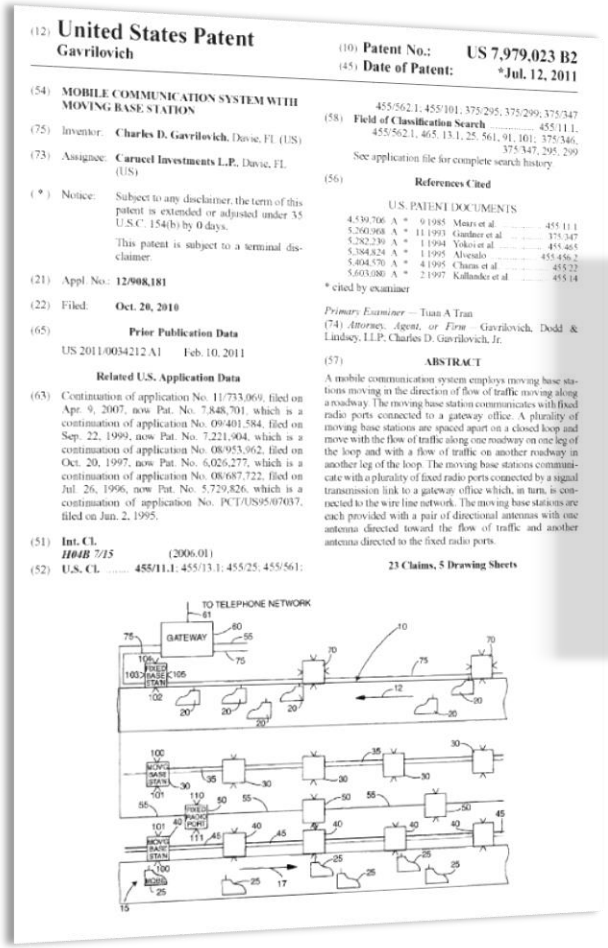
20. An apparatus in accordance with claim **19**, wherein the vehicle is an automotive vehicle.

21. An apparatus in accordance with claim **11**, wherein the receiver is further configured to receive fixed port signals from a plurality of fixed ports through the plurality of spatially separated antennas.

Ex. 1001, Claims 19-21.

- Since the Petition fails to show that *Massa* in combination with *Vogel* renders obvious all limitations of Claim 11, its challenges to Claims 19-21, fail for the same reasons.

Ground 2: *Massa* and *Vogel* with *Toshiba*



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Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

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(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history

(56) **References Cited**

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5,282,239	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

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23 Claims, 5 Drawing Sheets

Dependent Claim 16

16. An apparatus in accordance with claim **11**, further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.

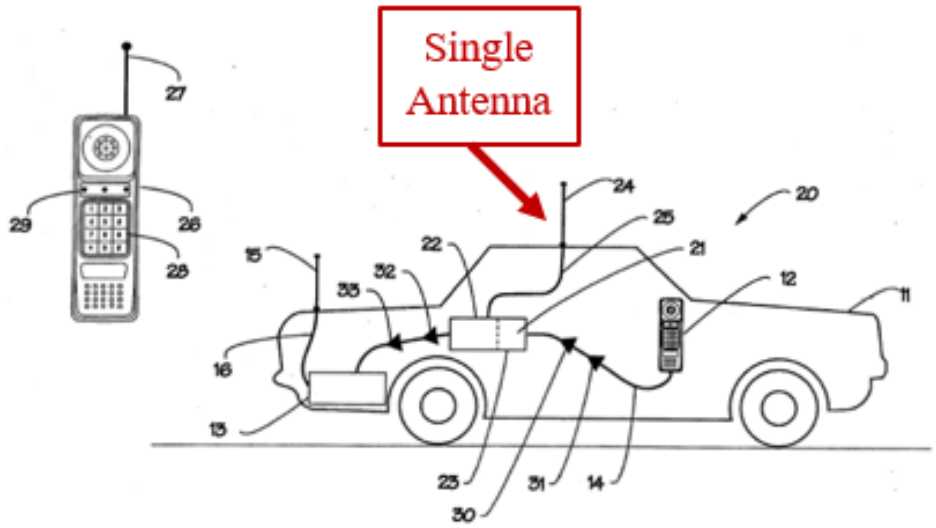
Ex. 1001, Claim 16.

Ground 2: Claim 16 – "through the spatially separated antennas"

- The Petitioner relies entirely on the combination of *Massa* and *Toshiba* to satisfy this limitation
- *Massa, Vogel, and Toshiba* do not disclose or render obvious "spatially separated antennas":

Massa

➢ *Massa* only discloses one auxiliary antenna (24), which is connected to the low-power, resident link transceiver (22).

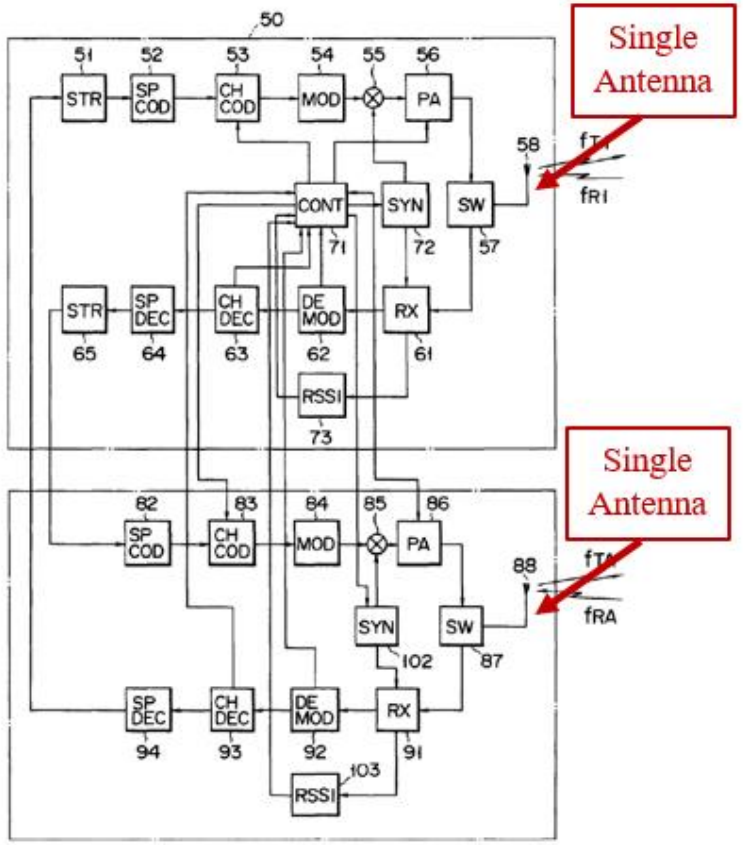


Ex. 1003, Figure 2 (Annotated).

Ground 2: Claim 16 – "through the spatially separated antennas"

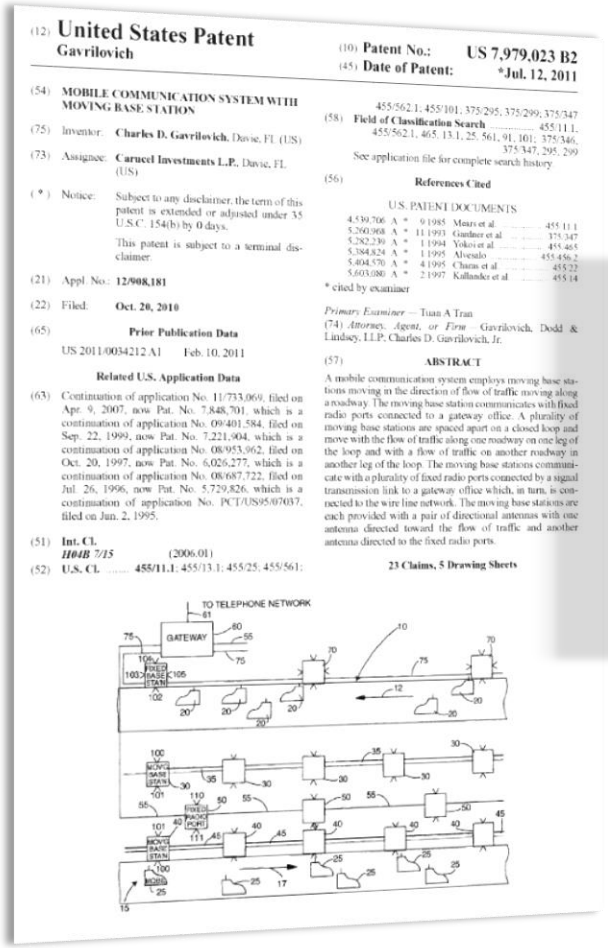
Toshiba

- Toshiba only discloses one antenna (58) for communication with the base station (BSS) and only has one antenna (88) for communication with the portable device (PSS).



Ex. 1006, Figure 3 (Annotated).

Ground 2: *Massa* and *Vogel* with *Toshiba*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history

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Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

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23 Claims, 5 Drawing Sheets

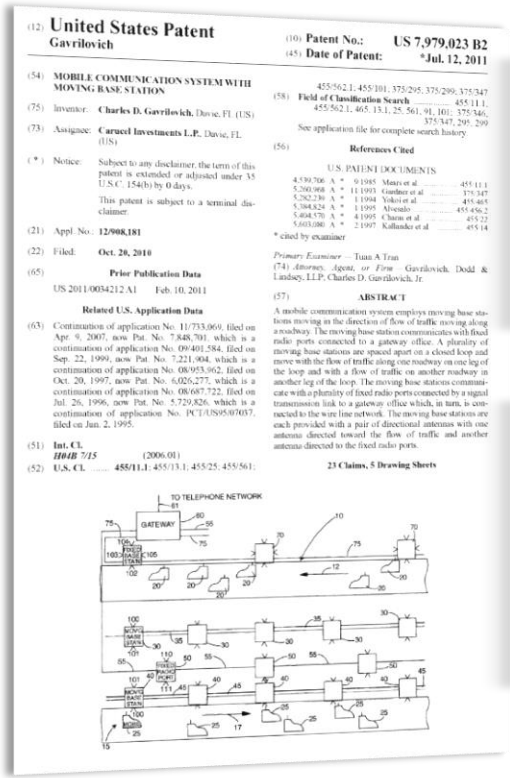
Dependent Claim 16

16. An apparatus in accordance with claim **11**, further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.

Ex. 1001, Claim 16.

Ground 2: Claim 16 – *"To Select a best signal"*

- the '023 Patent specification requires "best signal" to include an analysis of the signal quality (i.e., error rate) in addition to the signal strength:



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See application file for complete search history.

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23 Claims, 5 Drawing Sheets

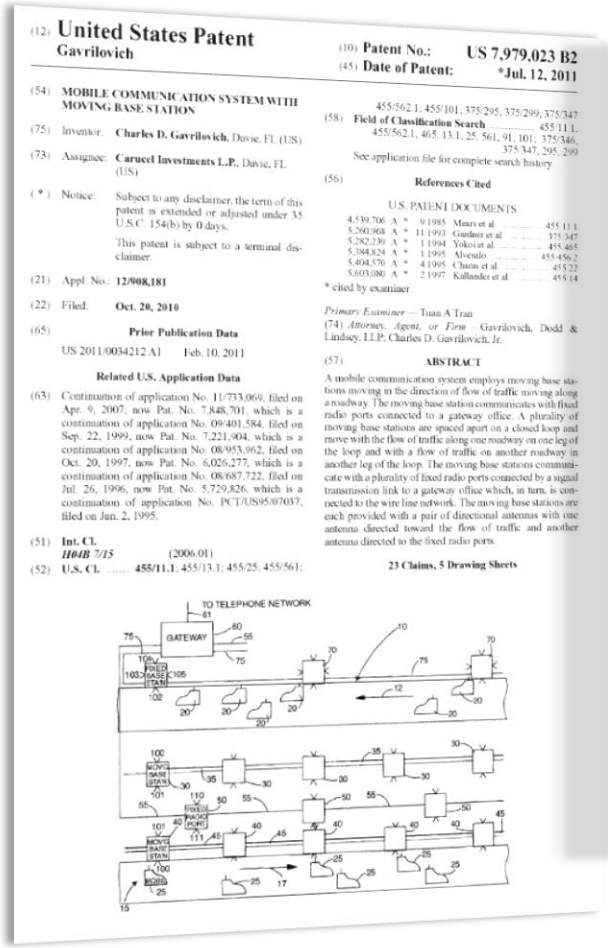
on the received signal. The signal quality indication is a figure of merit preferably computed as a function of signal strength and signal-to-noise ratio. It is added to the received data and

Ex. 1001, 10:13-15.

TDM frame errors. The best data, i.e., associated with the best signal quality indication is transferred from the gateway **60** to the telephone network. Data received from the telephone

Ex. 1001, 10:32-34.

Ground 2: Claim 16 – *"To Select a best signal"*



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H04B 7/15 (2006.01)

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(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
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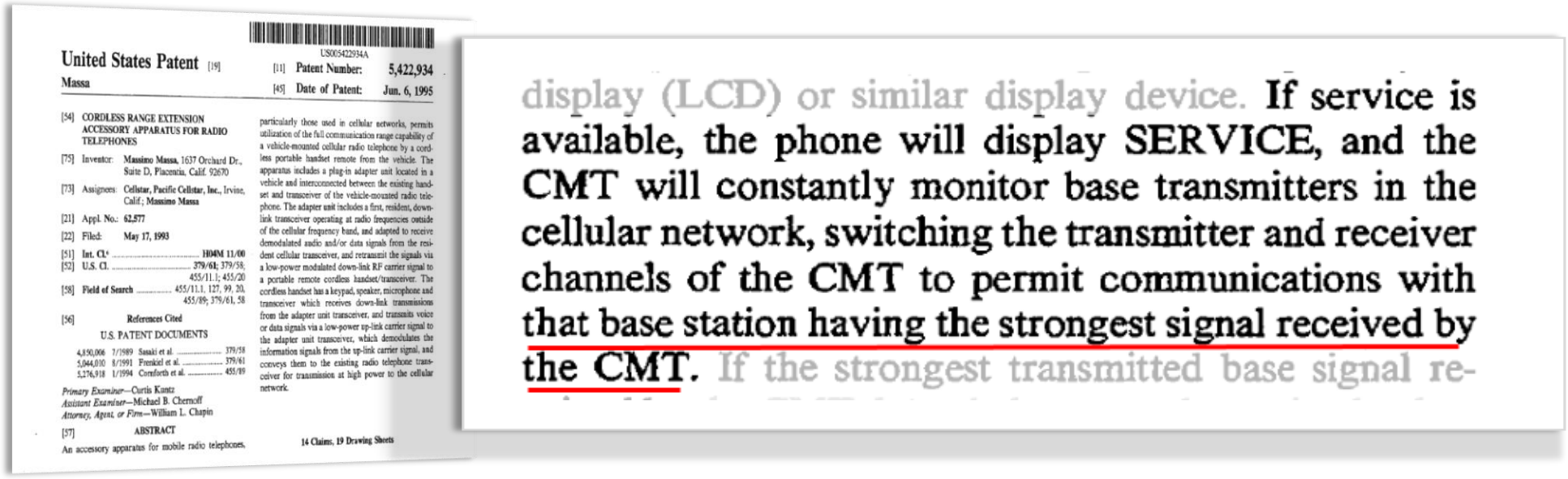
23 Claims, 5 Drawing Sheets

station and a moving base station. The procedures for determining whether a mobile unit is to be served by a fixed base station or a moving base station are the same procedures as described earlier herein in determining which moving base station is selected to serve a mobile unit, i.e., based on signal strength and error rate. Thus, when a call involving a mobile unit is initiated or when it is determined that a handoff should occur, the mobile unit may be handed from a moving station to a fixed station, or vice versa. Each mobile unit monitors pilot signals from fixed and moving base stations and synchronizes to the base station providing the best signal. The

Ex. 1001, 11:3-13.

Ground 2: Claim 16 – *"To Select a best signal"*

- *Massa*, *Vogel* and *Toshiba* do not disclose or render obvious "a controller configured . . . to select a best signal."
- Instead, *Massa* only discloses selecting "the strongest signal":



US005422934A

United States Patent [19]
Massa

[11] **Patent Number: 5,422,934**
[45] **Date of Patent: Jun. 6, 1995**

[54] CORDLESS RANGE EXTENSION ACCESSORY APPARATUS FOR RADIO TELEPHONES

[75] Inventor: **Massimo Massa**, 1637 Orchard Dr., Suite D, Placencia, Calif. 92670

[73] Assignees: **Cellstar, Pacific Cellstar, Inc.**, Irvine, Calif.; **Massimo Massa**

[21] Appl. No.: **62,577**

[22] Filed: **May 17, 1993**

[51] Int. Cl.[5] H04M 11/00
[52] U.S. Cl. 379/61; 379/58; 455/11.1; 455/20
[58] Field of Search 455/11.1, 127, 99, 20, 455/89; 379/61, 58

[56] References Cited
U.S. PATENT DOCUMENTS

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5,044,010	8/1991	Frenkiel et al.	379/61
5,276,918	1/1994	Cornforth et al.	455/89

Primary Examiner—Curtis Kuntz
Assistant Examiner—Michael B. Chernoff
Attorney, Agent, or Firm—William L. Chapin

[57] ABSTRACT

An accessory apparatus for mobile radio telephones, particularly those used in cellular networks, permits utilization of the full communication range capability of a vehicle-mounted cellular radio telephone by a cordless portable handset remote from the vehicle. The apparatus includes a plug-in adapter unit located in a vehicle and interconnected between the existing handset and transceiver of the vehicle-mounted radio telephone. The adapter unit includes a first, resident, down-link transceiver operating at radio frequencies outside of the cellular frequency band, and adapted to receive demodulated audio and/or data signals from the resident cellular transceiver, and retransmit the signals via a low-power modulated down-link RF carrier signal to a portable remote cordless handset/transceiver. The cordless handset has a keypad, speaker, microphone and transceiver which receives down-link transmissions from the adapter unit transceiver, and transmits voice or data signals via a low-power up-link carrier signal to the adapter unit transceiver, which demodulates the information signals from the up-link carrier signal, and conveys them to the existing radio telephone transceiver for transmission at high power to the cellular network.

14 Claims, 19 Drawing Sheets

display (LCD) or similar display device. **If service is available, the phone will display SERVICE, and the CMT will constantly monitor base transmitters in the cellular network, switching the transmitter and receiver channels of the CMT to permit communications with that base station having the strongest signal received by the CMT.** If the strongest transmitted base signal re-

Ex. 1003, 17:5-11.

- selecting the strongest signal ≠ "select[ing] a best signal"

Ground 2: Claim 16 – *"To Select a best signal"*

- The Petition and Dr. Madisetti fail to provide:
  - any explanation as to how or why a POSITA would only focus on "strongest signal" while ignoring other factors such as error rate when determining the "best signal";
  - any actual evidentiary support; And
  - any of the underlying facts or data on which his conclusory assertion is based.
- Petitioner has not alleged any reason, other than its own opinion, that a POSITA would equate the two.

Ground 2: Claim 16 – Strongest Signal ≠ "Best Signal"

K/S HIMPP v. Hear-Wear Techs., LLC

"[A]n assessment of basic knowledge and common sense as a replacement for documentary evidence for core factual findings lacks substantial evidence support."

K/S HIMPP v. Hear-Wear Techs., LLC, 751 F.3d 1362 (Fed. Cir. 2014).

Ground 2: Claim 16 – Strongest Signal ≠ "Best Signal"

- In stark contrast, a POSITA would understand that the strongest signal is not always the "best signal":

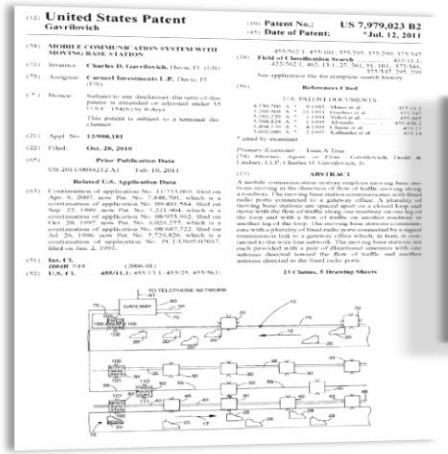
Testimony of Carucel's Expert

signal" and fails to provide any evidentiary support for his conclusory assertion. Based upon my experience, the strongest signal may not be the best signal received by the mobile phone, as Dr. Madisetti opines, because the strongest received signal may not be coming from the correct cellular network operator or the strongest signal may have some type of distortion that would cause errors in the data being received.

IPR2019-01079, Ex. 2100 at ¶ 180.

Ground 3: *Massa* and *Vogel* with *Padvoni*

Dependent Claim 21

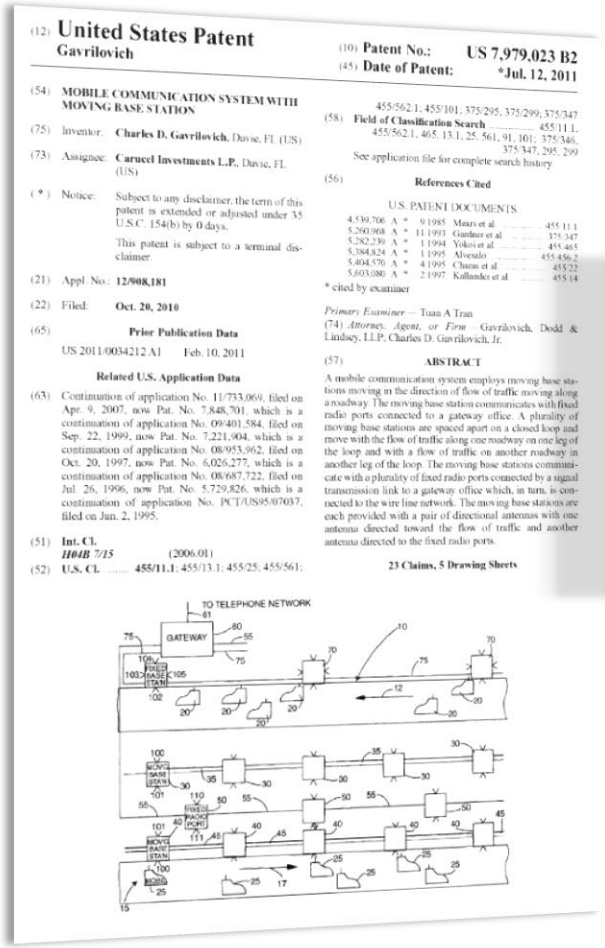


21. An apparatus in accordance with claim **11**, wherein the receiver is further configured to receive fixed port signals from a plurality of fixed ports through the plurality of spatially separated antennas.

Ex. 1001, Claim 21.

- Since the Petition fails to show that *Massa* in combination with *Vogel* renders obvious all limitations of Claim 11 (Ground 1), its challenge to Claim 21 fails for the same reasons, as Petitioner does not rely on *Padovani* to satisfy the limitations of Claim 11.

Ground 3: *Massa* and *Vogel* with *Padvoni*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706	A *	9/1985	Mears et al.	455/11.1
5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,239	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

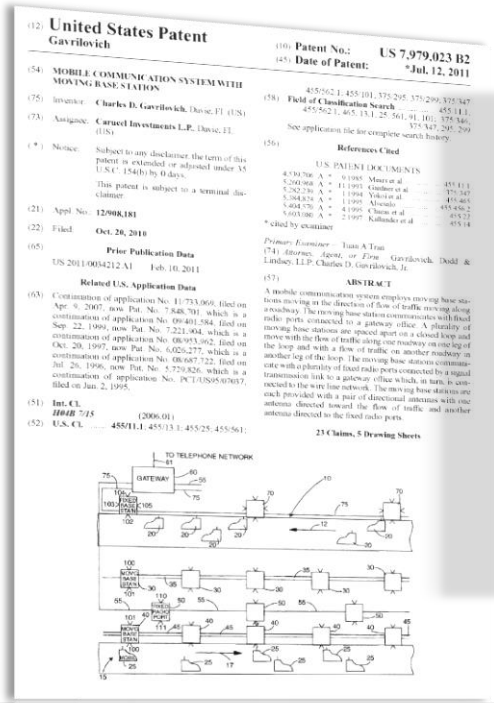
Dependent Claim 22

22. An apparatus in accordance with claim **21**, wherein each fixed port signal transmitted from each of the plurality of fixed ports includes common data.

Ex. 1001, Claim 22.

Ground 3: Claim 22 – "Common Data"

- The '023 Patent specification requires that this common data includes (i) "data representing voice signals" [i.e., the payload (what is communicated)] in addition to "call related information" [e.g., preamble data or bits added by an encoder]:



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

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(51) **Int. Cl.**
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(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561;

(58) **Field of Classification Search** 455/562.1; 455/101; 375/295; 375/299; 375/347
455/562.1; 465; 13.1, 25, 561, 91, 101; 375/346; 375/347; 295, 299
See application file for complete search history.

(56) **References Cited**

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5,282,250 A * 1/1994 Yokev et al. 455/465
5,384,824 A * 1/1995 Alvesalo 455/456.2
5,404,570 A * 4/1995 Chuan et al. 455/27
5,603,096 A * 2/1997 Kallander et al. 455/14

* cited by examiner

Primary Examiner – Tuan A Tran
(74) *Attorney, Agent, or Firm* – Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

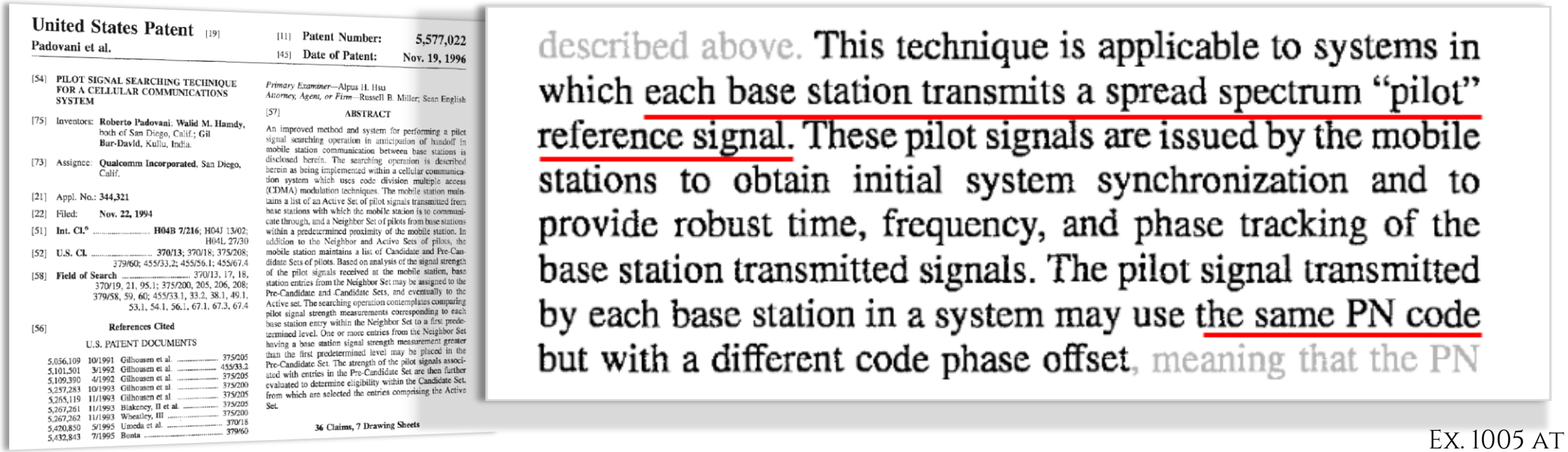
23 Claims, 5 Drawing Sheets

general type as the directional antennas **100-105**. 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 **110**, **111** on the fixed radio ports **50**.

Ex. 1001, 10:32-34.

Ground 3: Claim 22 – "Common Data"

- *Massa*, *Vogel*, and *Padovani* do not disclose or render obvious the transmission of (1) "data representing voice signals" or (2) "call related information"
- Instead, *Padovani* only discloses the transmission of Pseudo Noise (PN) codes:



United States Patent [19]
Padovani et al.

[11] Patent Number: 5,577,022
[45] Date of Patent: Nov. 19, 1996

[54] PILOT SIGNAL SEARCHING TECHNIQUE FOR A CELLULAR COMMUNICATIONS SYSTEM

[75] Inventors: Roberto Padovani, Walid M. Hamdy, both of San Diego, Calif.; Gil Bar-David, Kullu, India.

[73] Assignee: Qualcomm Incorporated, San Diego, Calif.

[21] Appl. No.: 344,321

[22] Filed: Nov. 22, 1994

[51] Int. Cl.[6] H04B 7/216; H04J 13/02; H04L 27/30

[52] U.S. Cl. 370/13; 370/18; 375/208; 379/60; 455/33.2; 455/56.1; 455/67.4

[58] Field of Search 370/13, 17, 18, 370/19, 21, 95.1; 375/200, 205, 206, 208; 379/58, 59, 60; 455/33.1, 33.2, 38.1, 49.1, 53.1, 54.1, 56.1, 67.1, 67.3, 67.4

[56] References Cited

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5,101,501	3/1992	Gilhousen et al.	455/33.2
5,109,390	4/1992	Gilhousen et al.	375/205
5,257,283	10/1993	Gilhousen et al.	375/200
5,265,119	11/1993	Gilhousen et al.	375/205
5,267,261	11/1993	Blakeney, II et al.	375/205
5,267,262	11/1993	Wheatley, III	375/200
5,420,850	5/1995	Umeda et al.	370/18
5,432,843	7/1995	Bonta	379/60

Primary Examiner—Alpus H. Hsu
Attorney, Agent, or Firm—Russell B. Miller; Sean English

[57] ABSTRACT

An improved method and system for performing a pilot signal searching operation in anticipation of handoff in mobile station communication between base stations is disclosed herein. The searching operation is described herein as being implemented within a cellular communication system which uses code division multiple access (CDMA) modulation techniques. The mobile station maintains a list of an Active Set of pilot signals transmitted from base stations with which the mobile station is to communicate through, and a Neighbor Set of pilots from base stations within a predetermined proximity of the mobile station. In addition to the Neighbor and Active Sets of pilots, the mobile station maintains a list of Candidate and Pre-Candidate Sets of pilots. Based on analysis of the signal strength of the pilot signals received at the mobile station, base station entries from the Neighbor Set may be assigned to the Pre-Candidate and Candidate Sets, and eventually to the Active set. The searching operation contemplates comparing pilot signal strength measurements corresponding to each base station entry within the Neighbor Set to a first predetermined level. One or more entries from the Neighbor Set having a base station signal strength measurement greater than the first predetermined level may be placed in the Pre-Candidate Set. The strength of the pilot signals associated with entries in the Pre-Candidate Set are then further evaluated to determine eligibility within the Candidate Set, from which are selected the entries comprising the Active Set.

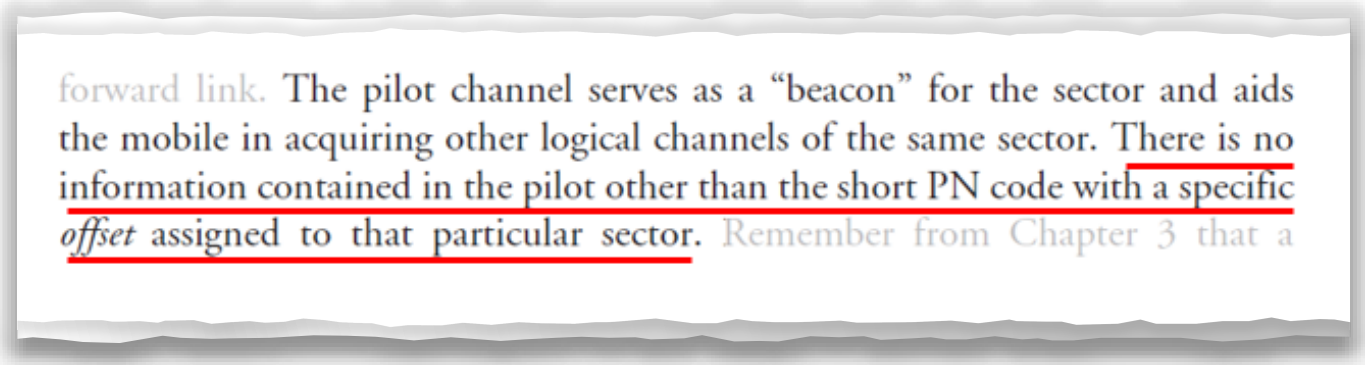
36 Claims, 7 Drawing Sheets

described above. This technique is applicable to systems in which each base station transmits a spread spectrum "pilot" reference signal. These pilot signals are issued by the mobile stations to obtain initial system synchronization and to provide robust time, frequency, and phase tracking of the base station transmitted signals. The pilot signal transmitted by each base station in a system may use the same PN code but with a different code phase offset, meaning that the PN

Ex. 1005 at 2:47-54.

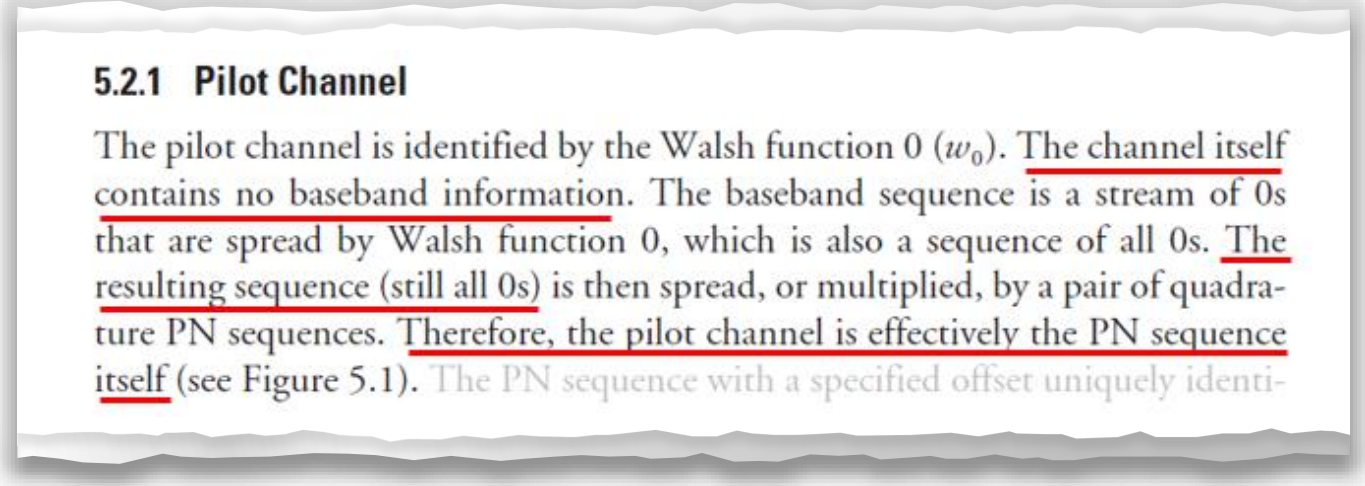
Ground 3: Claim 22 – PN codes ≠ "Common Data"

- A POSITA would understand that a Pseudo Noise (PN) code does not carry any data, including "common data":



forward link. The pilot channel serves as a "beacon" for the sector and aids the mobile in acquiring other logical channels of the same sector. There is no information contained in the pilot other than the short PN code with a specific *offset* assigned to that particular sector. Remember from Chapter 3 that a

Ex. 2109 at p. 111.

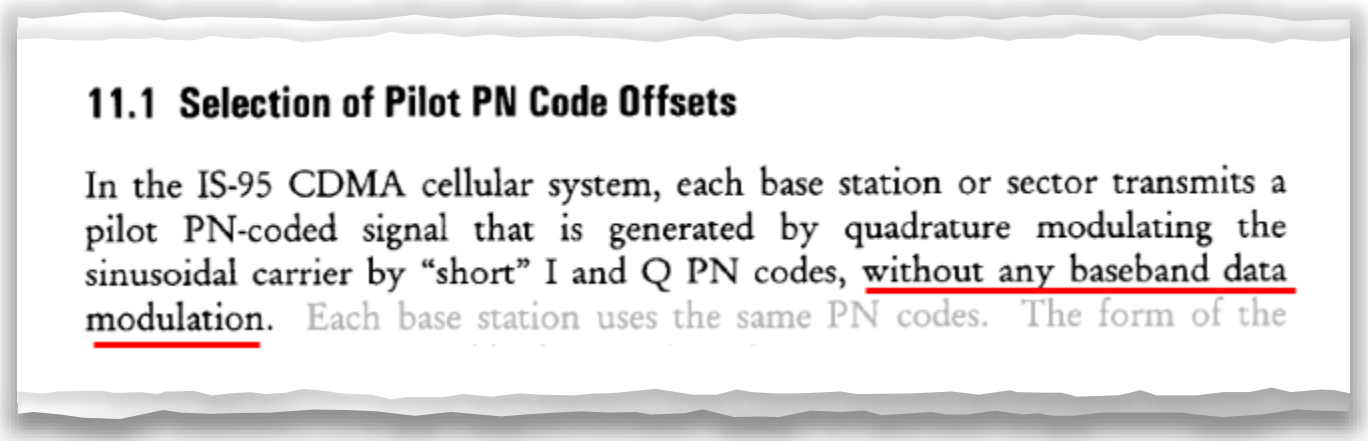


5.2.1 Pilot Channel

The pilot channel is identified by the Walsh function 0 (w_0). The channel itself contains no baseband information. The baseband sequence is a stream of 0s that are spread by Walsh function 0, which is also a sequence of all 0s. The resulting sequence (still all 0s) is then spread, or multiplied, by a pair of quadrature PN sequences. Therefore, the pilot channel is effectively the PN sequence itself (see Figure 5.1). The PN sequence with a specified offset uniquely identi-

Ex. 2109 at p. 118.

Ground 3: Claim 22 – PN code ≠ Common Data



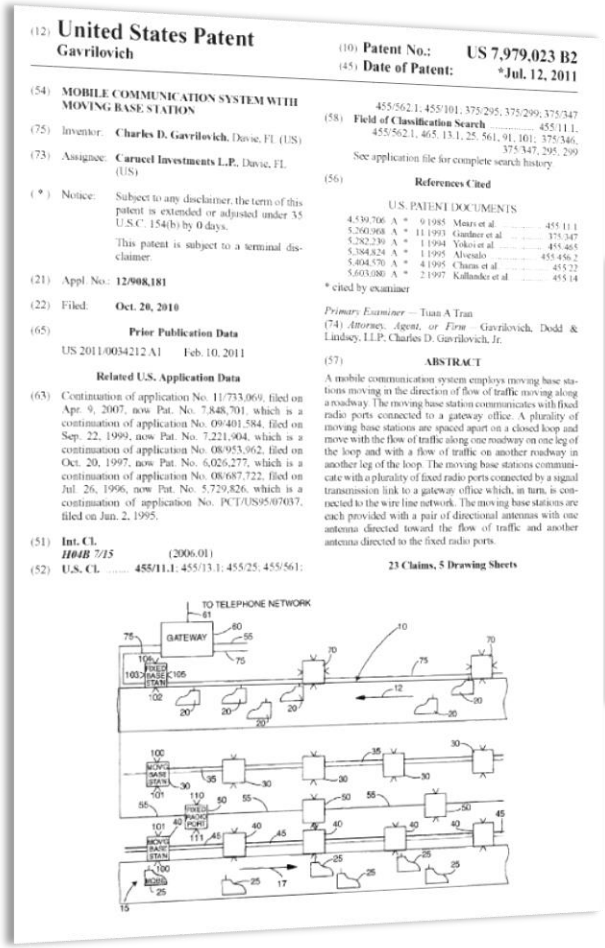
11.1 Selection of Pilot PN Code Offsets

In the IS-95 CDMA cellular system, each base station or sector transmits a pilot PN-coded signal that is generated by quadrature modulating the sinusoidal carrier by "short" I and Q PN codes, without any baseband data modulation. Each base station uses the same PN codes. The form of the

Ex. 2110 at p. 1112.

- If the PN codes were modulated with any "common data", as Petitioner proposes, mobile phones would not be able to decode it because it would be different than the predefined pilot code they all search for.
  - ➢ As a result, the cellular network would not be able to operate.

Ground 3: *Massa* and *Vogel* with *Padvoni*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

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* cited by examiner

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(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

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23 Claims, 5 Drawing Sheets

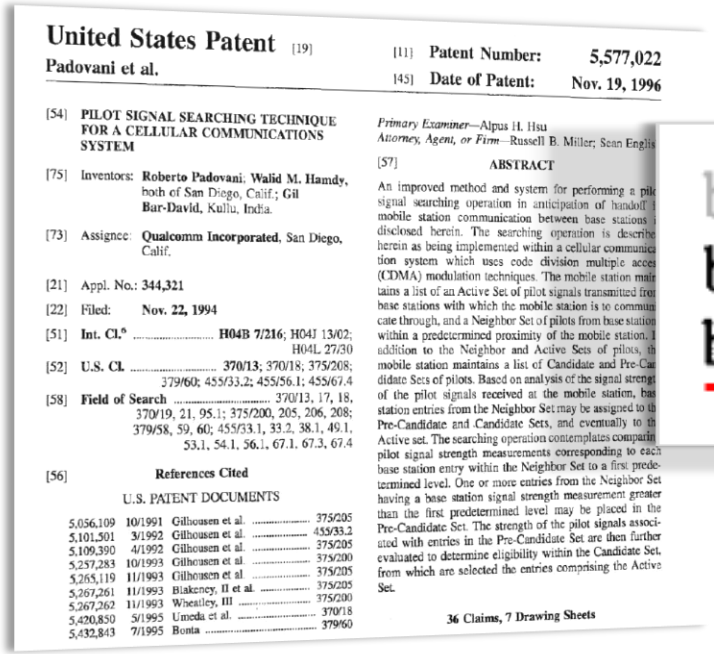
Dependent Claim 23

23. An apparatus in accordance with claim **22**, wherein transmission of each fixed port signal from each of the plurality of fixed ports is delayed by a different time and the receiver is configured to receive and separate the fixed port signals.

Ex. 1001, Claim 23.

Ground 3: Claim 23 – "Delayed by a Different Time"

- *Massa, Vogel, and Padovani* do not disclose or render obvious fixed port signals that are "Delayed by a different time."
- Instead, *Padovani* only discloses the transmission of PN codes <u>with a different code phase offset</u>:



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[58] Field of Search 370/13, 17, 18, 370/19, 21, 95.1; 375/200, 205, 206, 208; 379/58, 59, 60; 455/33.1, 33.2, 38.1, 49.1, 53.1, 54.1, 56.1, 67.1, 67.3, 67.4

[56] References Cited

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Primary Examiner—Alpus H. Hsu
Attorney, Agent, or Firm—Russell B. Miller; Sean Englis

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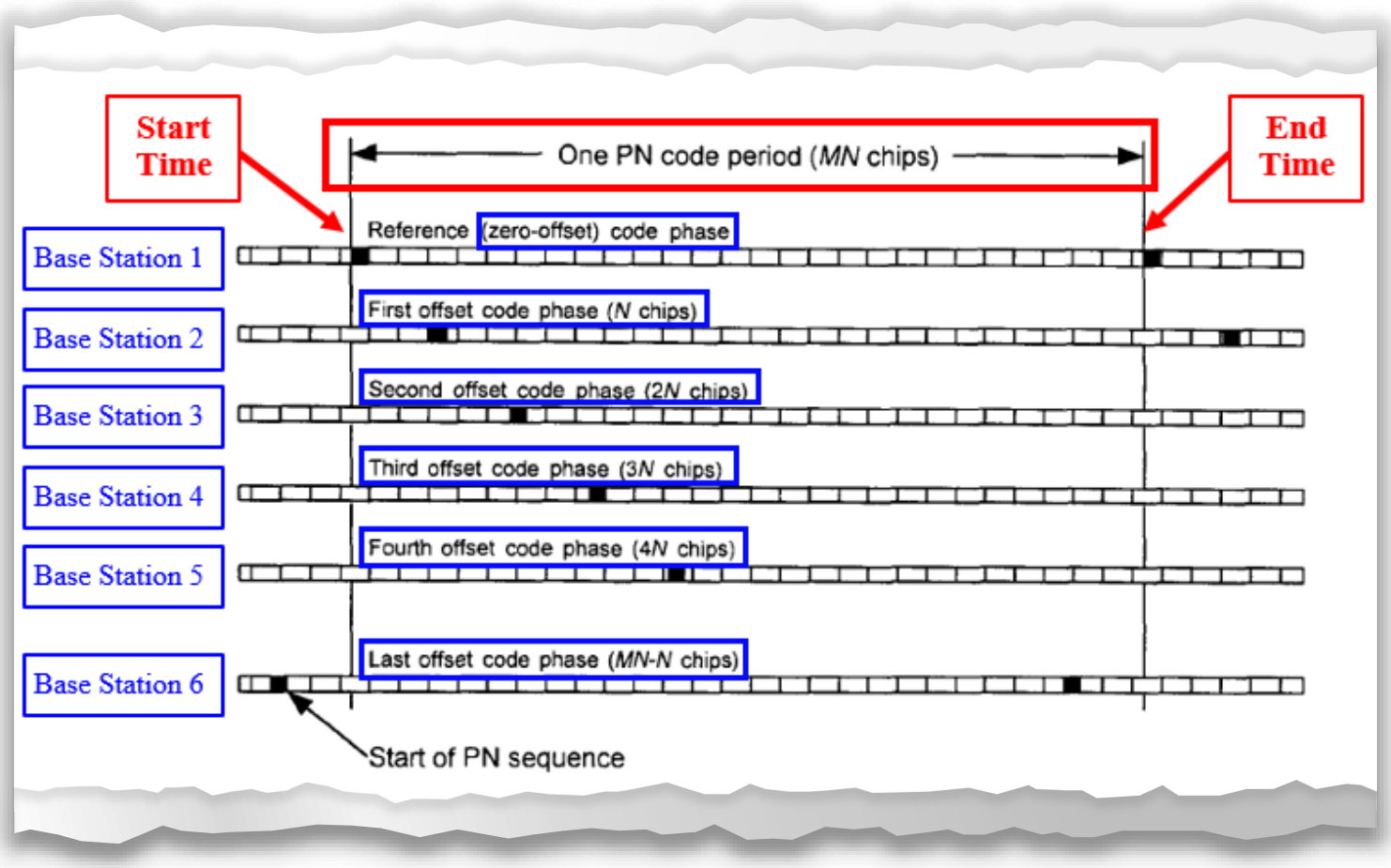
36 Claims, 7 Drawing Sheets

base station transmitted signals. **The pilot signal transmitted by each base station in a system may use the same PN code but with a different code phase offset**, meaning that the PN

Ex. 1005 at 2:52-54.

Ground 3: Claim 23 – PN code offsets ≠ Time Delay

- The two vertical lines are showing the start time and end time that all of the base stations are transmitting their PN codes.
- The rows represent different base stations.
- The black box on each row is showing the Code Phase.
- <u>Every row is transmitting at the same time as shown by the vertical line of the left</u>.



Ex. 2110 at p 1113.

Ground 3: Claim 23 – *Padovani* is a Synchronized CDMA network

- A POSITA would have understood that *Padovani's* CDMA system and its associated pilot codes are not "Delayed by a different time" with each other.
  - Because the CDMA network disclosed by *Padovani* is synchronized:

4.1.2 System Time

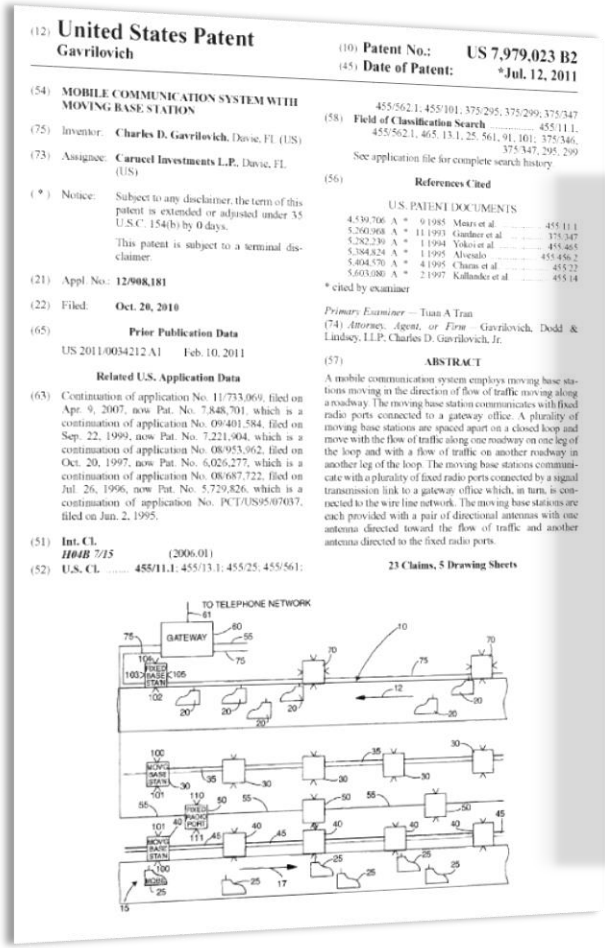
While the maintenance of a systemwide time standard is not essential to the analog cellular system, it is a critical component of the CDMA digital cellular system design. Each base station of the IS-95 system is required to maintain a clock that is synchronized to GPS time signals. The known beginning of the GPS time count (time 00:00:00 on Jan. 6, 1980) is traceable to Universal

Ex. 2110 at p. 361.

Ground 3: Claim 23 – *Padovani* is a Synchronized CDMA network

- This means each base station receives the same timing source, so they all will synchronized with each other.
  - ➢ therefore, each base station transmits the start of the pilot code at the same time and it is not skewed.
- If the pilot codes of *Padovani* were actually "Delayed by a different time", the synchronous CDMA system disclosed by *Padovani* would simply not work.

Ground 4: *Thrower* with *Kaewell*



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Related U.S. Application Data

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history

(56) **References Cited**

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5,282,239	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Independent Claim 11

11. An apparatus configured to move relative to Earth, the apparatus comprising:

a plurality of spatially separated antennas; and

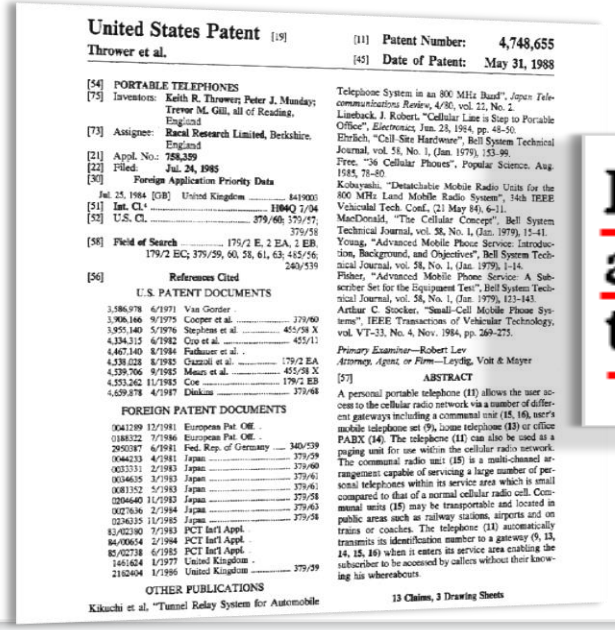
a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas; and

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

Ex. 1001, Claim 11.

Ground 4: Claim 11 – "A Mobile Device"

- *Thrower* and *Kaewell* do not disclose or render obvious "a mobile device" in the context of the entire '023 Patent.
- First, *Thrower* discloses That its personal telephone can only communicate with a base station and a cellular network via *Thrower's* gateway device:



United States Patent [19]
Thrower et al.

[11] Patent Number: 4,748,655
[45] Date of Patent: May 31, 1988

[54] PORTABLE TELEPHONES
[75] Inventors: Keith R. Thrower; Peter J. Munday; Trevor M. Gill, all of Reading, England
[73] Assignee: Racal Research Limited, Berkshire, England
[21] Appl. No.: 758,339
[22] Filed: Jul. 24, 1985
[30] Foreign Application Priority Data
Jul. 25, 1984 [GB] United Kingdom 8419000
[51] Int. Cl.[4] H04Q 7/04
[52] U.S. Cl. 379/60; 379/57; 379/58
[58] Field of Search ..... 179/2 E, 2 EA, 2 EB, 179/2 EC; 379/59, 60, 58, 61, 63; 455/56, 240/539

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4,467,140	8/1984	Fathauer et al.	
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0033331	2/1983	Japan	379/60
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0081352	5/1983	Japan	379/61
0204640	11/1983	Japan	379/58
0027636	2/1984	Japan	379/63
0236335	11/1985	Japan	379/58
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84/00654	2/1984	PCT Int'l Appl.	
85/02738	6/1985	PCT Int'l Appl.	
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Linebuck, J. Robert, "Cellular Line is Step to Portable Office", *Electronics*, Jan. 28, 1984, pp. 48-50.
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Kobayashi, "Detachable Mobile Radio Units for the 800 MHz Land Mobile Radio System", 34th IEEE Vehicular Tech. Conf., (21 May 84), 6-11.
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Young, "Advanced Mobile Phone Service: Introduction, Background, and Objectives", Bell System Technical Journal, vol. 58, No. 1, (Jan. 1979), 1-14.
Fisher, "Advanced Mobile Phone Service: A Subscriber Set for the Equipment Test", Bell System Technical Journal, vol. 58, No. 1, (Jan. 1979), 123-143.
Arthur C. Stocker, "Small-Cell Mobile Phone Systems", IEEE Transactions of Vehicular Technology, vol. VT-33, No. 4, Nov. 1984, pp. 269-275.

Primary Examiner—Robert Lev
Attorney, Agent, or Firm—Leydig, Voit & Mayer

[57] ABSTRACT
A personal portable telephone (11) allows the user access to the cellular radio network via a number of different gateways including a communal unit (15, 16), user's mobile telephone set (9), home telephone (13) or office PABX (14). The telephone (11) can also be used as a paging unit for use within the cellular radio network. The communal radio unit (15) is a multi-channel arrangement capable of servicing a large number of personal telephones within its service area which is small compared to that of a normal cellular radio cell. Communal units (15) may be transportable and located in public areas such as railway stations, airports and on trains or coaches. The telephone (11) automatically transmits its identification number to a gateway (9, 13, 14, 15, 16) when it enters its service area enabling the subscriber to be accessed by callers without their knowing his whereabouts.

13 Claims, 3 Drawing Sheets

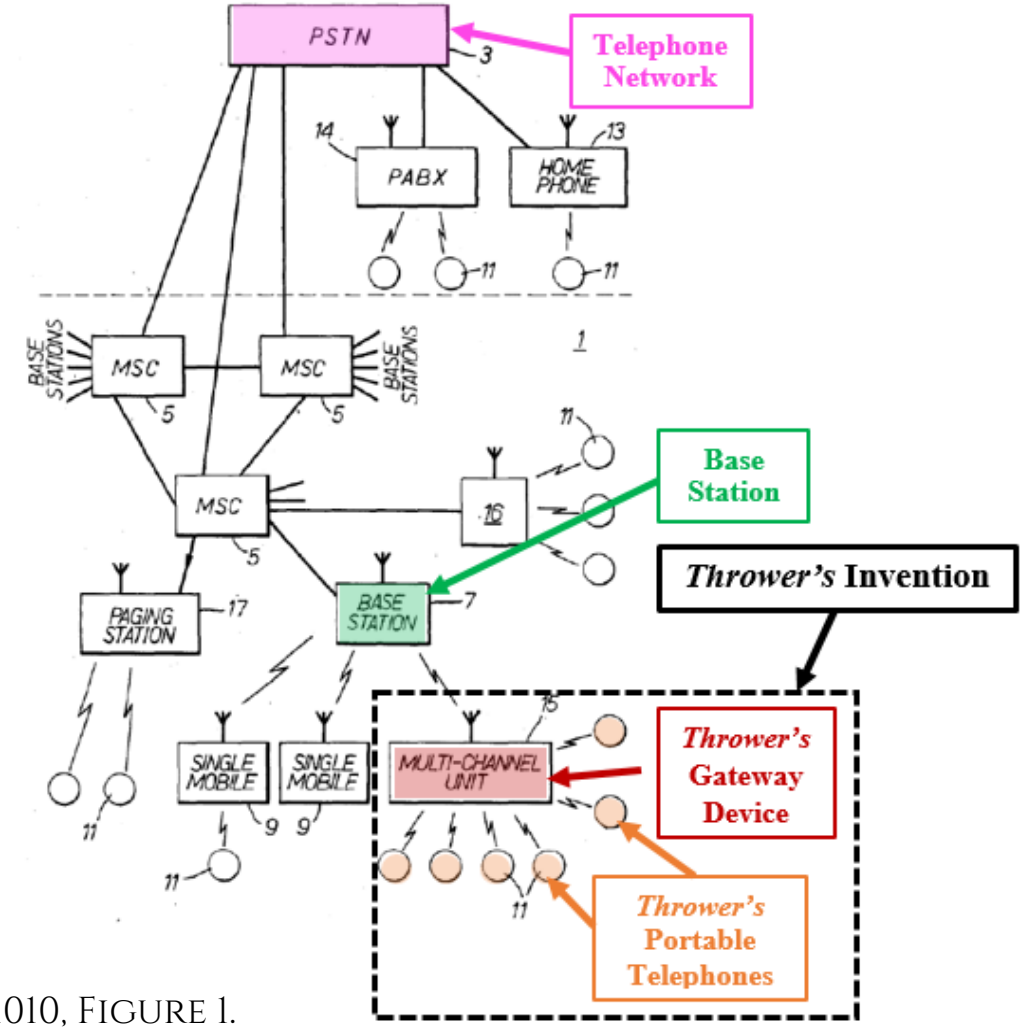
Portable telephones communicate with base stations via a gateway device rather than directly to the base stations. When a portable telephone is switched on, it

Ex. 1010, 1:63-65.

Ground 4: Claim 11 – "A Mobile Device"

- *Thrower's* personal telephone (11) does not communicate directly with either the base station (7) or the telephone network (3).

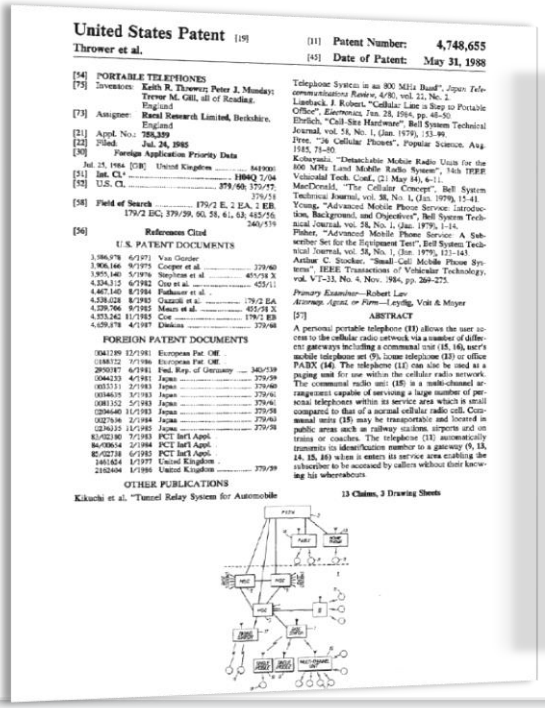
- Instead, *Thrower's* personal telephone (11) can only communicate with the base station (7) and the telephone network (3) via *Thrower's* gateway device (15).



Ex. 1010, Figure 1.

Ground 4: Claim 11 – "A Mobile Device"

- Second, *Thrower* further discloses that its personal telephone is not capable of registering with a cellular network by itself—*Thrower's* portable telephone must rely on *Thrower's* separate gateway device to perform this registration:



United States Patent [19]
Thrower et al.

[11] Patent Number: 4,748,655
[45] Date of Patent: May 31, 1988

[54] PORTABLE TELEPHONES
[75] Inventors: Keith R. Thrower; Peter J. Munday; Trevor M. Gill, all of Reading, England
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[21] Appl. No.: 788,389
[22] Filed: Jul. 24, 1985
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Jul. 25, 1984 [GB] United Kingdom 8419000
[51] Int. Cl.* H04Q 7/04
[52] U.S. Cl. 379/60; 379/57; 379/58
[58] Field of Search ..... 179/2 E, 2 EA, 2 EB, 179/2 EC; 379/59, 60, 58, 61, 63; 455/56, 240/539
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1461604 1/1977 United Kingdom .
2162404 1/1986 United Kingdom 379/59
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Primary Examiner—Robert Law
Attorney, Agent, or Firm—Leydig, Voit & Mayer
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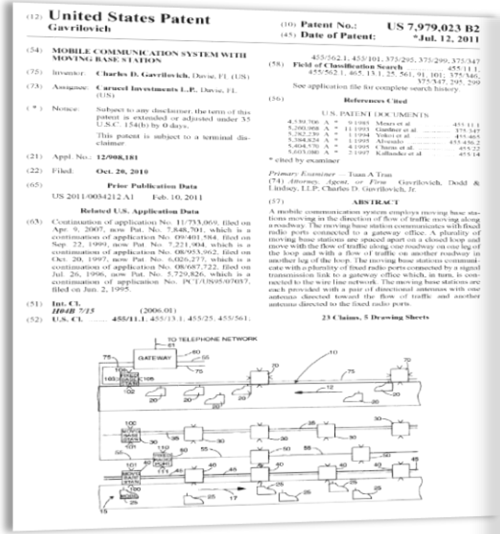
13 Claims, 3 Drawing Sheets

phones by means of a plurality of fixed channels, **each telephone having a subscriber identification number which is transmitted over a channel to the gateway when the telephone enters the service area of that gateway and is registered via the gateway with the cellular radio network to establish the location of the telephone subscriber for receipt of calls.**

Ex. 1010, 2:36-42.

Ground 4: *Thrower* with *Kaewell*

Dependent Claims 16, 19, and 20


United States Patent
Gavrilovich
US 7,979,023 B2
*Jul. 12, 2011

16. An apparatus in accordance with claim 11, further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.

. . . .

19. An apparatus in accordance with claim 11, wherein the apparatus is conveyed by a vehicle.

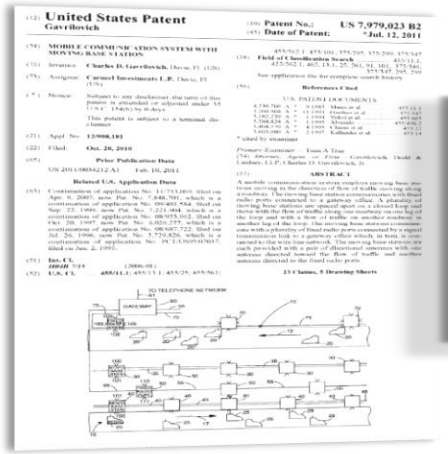
20. An apparatus in accordance with claim 19, wherein the vehicle is an automotive vehicle.

Ex. 1001, Claims 16, 19, 20.

- Since the Petition fails to show that *Thrower* in combination with *Kaewell* renders obvious all limitations of Claim 11, its challenges to Claims 16, 19 and 20 fail for the same reasons.

Ground 5: *Thrower and Kaewell* with *Blakeney*

Dependent Claim 21

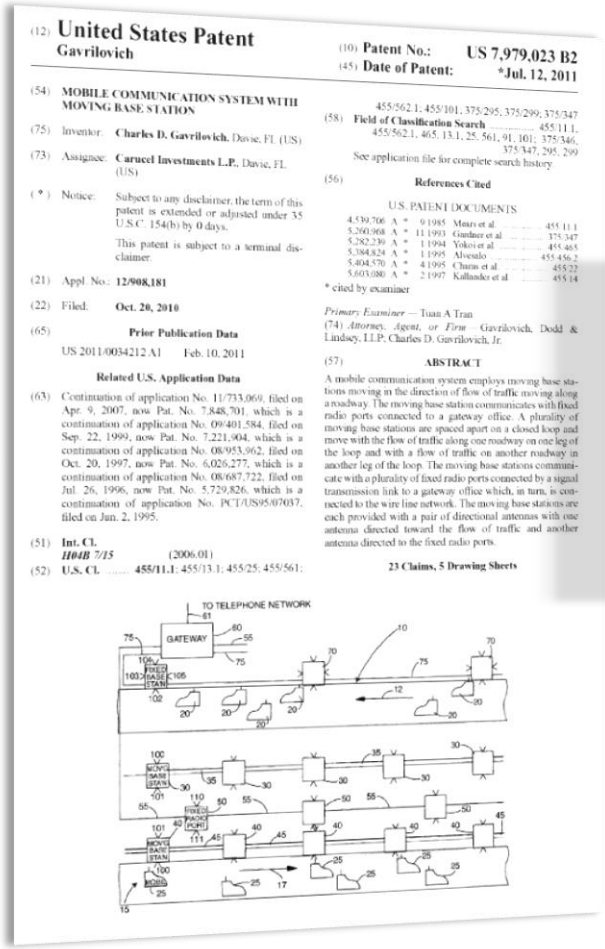


21. An apparatus in accordance with claim **11**, wherein the receiver is further configured to receive fixed port signals from a plurality of fixed ports through the plurality of spatially separated antennas.

Ex. 1001, Claim 21.

- Since the Petition fails to show that *Thrower* in combination with *Kaewell* renders obvious all limitations of Claim 11 (Ground 4), its challenge to Claim 21 fails for the same reasons, as Petitioner does not rely on *Blakeney* to satisfy the limitations of Claim 11.

Ground 5: *Thrower and Kaewell* with *Blakeney*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465.13.1; 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history.

(56) **References Cited**

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5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

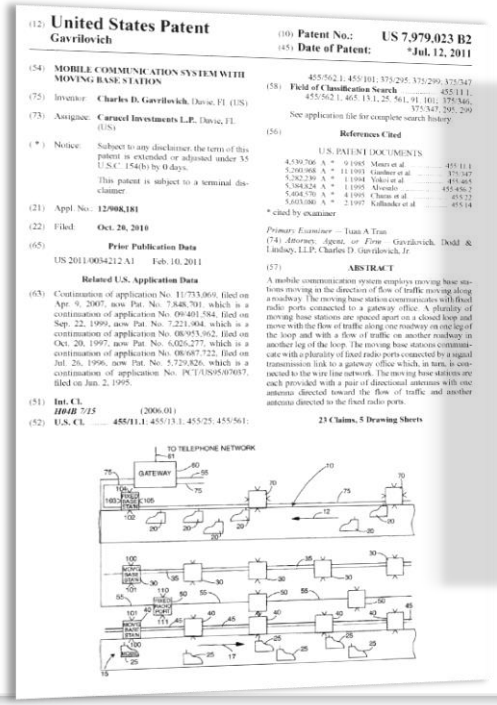
Dependent Claim 22

22. An apparatus in accordance with claim **21**, wherein each fixed port signal transmitted from each of the plurality of fixed ports includes common data.

Ex. 1001, Claim 22.

Ground 5: Claim 22 – "Common Data"

- The '023 Patent specification requires that this common data includes (i) "data representing voice signals" [i.e., the payload (what is communicated)] in addition to "call related information" [e.g., preamble data or bits added by an encoder]:



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Gavrilovich

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(45) **Date of Patent: *Jul. 12, 2011**

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(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

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5,282,239	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Abesado	455/456.2
5,404,570	A *	4/1995	Chorin et al.	455/22
5,603,080	A *	2/1997	Kullander et al.	455/14

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Primary Examiner — Tuan A Tran
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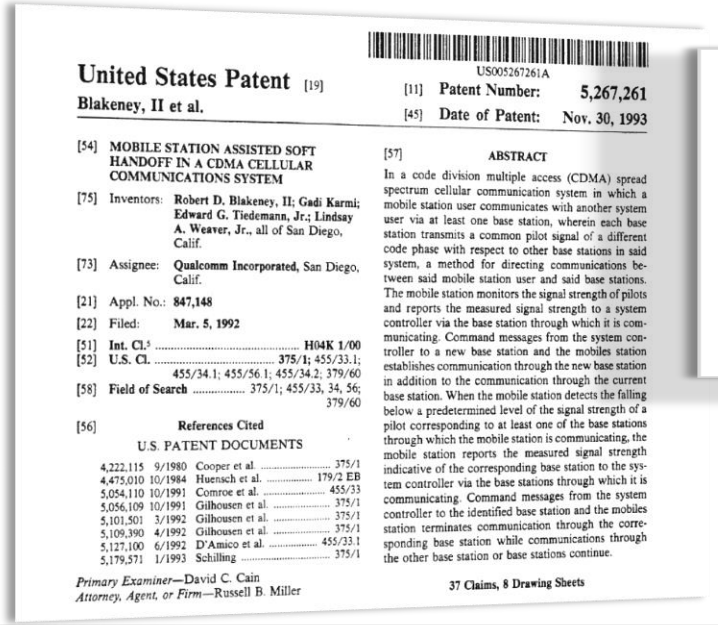
23 Claims, 5 Drawing Sheets

general type as the directional antennas **100-105**. 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 **110**, **111** on the fixed radio ports **50**.

Ex. 1001, 10:32-34.

Ground 5: Claim 22 – "Common Data"

- *Thrower*, *Kaewell* and *Blakeney* do not disclose or render obvious the transmission of (1) "data representing voice signals" or (2) "call related information"
- Instead, *Blakeney* only discloses the transmission of Pseudo Noise (PN) codes:



United States Patent [19]
Blakeney, II et al.

US005267261A
[11] Patent Number: 5,267,261
[45] Date of Patent: Nov. 30, 1993

[54] MOBILE STATION ASSISTED SOFT HANDOFF IN A CDMA CELLULAR COMMUNICATIONS SYSTEM

[75] Inventors: Robert D. Blakeney, II; Gadi Karmi; Edward G. Tiedemann, Jr.; Lindsay A. Weaver, Jr., all of San Diego, Calif.

[73] Assignee: Qualcomm Incorporated, San Diego, Calif.

[21] Appl. No.: 847,148

[22] Filed: Mar. 5, 1992

[51] Int. Cl.[5] H04K 1/00
[52] U.S. Cl. 375/1; 455/33.1; 455/34.1; 455/56.1; 455/34.2; 379/60
[58] Field of Search 375/1; 455/33, 34, 56; 379/60

[56] References Cited
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5,179,571	1/1993	Schilling	375/1

Primary Examiner—David C. Cain
Attorney, Agent, or Firm—Russell B. Miller

[57] ABSTRACT

In a code division multiple access (CDMA) spread spectrum cellular communication system in which a mobile station user communicates with another system user via at least one base station, wherein each base station transmits a common pilot signal of a different code phase with respect to other base stations in said system, a method for directing communications between said mobile station user and said base stations. The mobile station monitors the signal strength of pilots and reports the measured signal strength to a system controller via the base station through which it is communicating. Command messages from the system controller to a new base station and the mobiles station establishes communication through the new base station in addition to the communication through the current base station. When the mobile station detects the falling below a predetermined level of the signal strength of a pilot corresponding to at least one of the base stations through which the mobile station is communicating, the mobile station reports the measured signal strength indicative of the corresponding base station to the system controller via the base stations through which it is communicating. Command messages from the system controller to the identified base station and the mobiles station terminates communication through the corresponding base station while communications through the other base station or base stations continue.

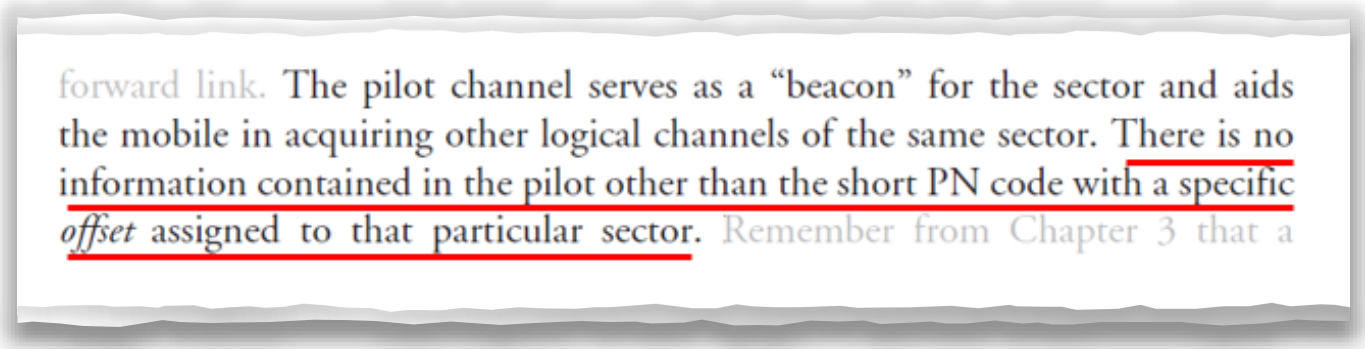
37 Claims, 8 Drawing Sheets

The pilot signal as transmitted by each base station is of the same PN spreading code but with a different code phase offset. For example, in the present invention the

Ex. 1012 at 6:17-20.

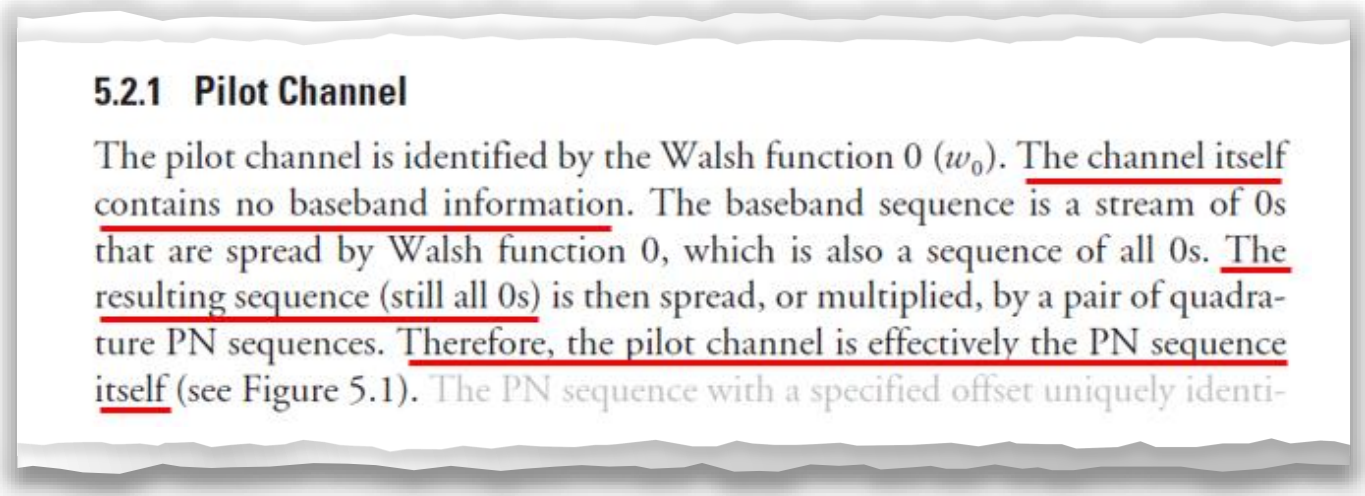
Ground 5: Claim 22 – PN codes ≠ "Common Data"

- a POSITA would understand that a Pseudo Noise (PN) code does not carry any data, including "common data":



forward link. The pilot channel serves as a "beacon" for the sector and aids the mobile in acquiring other logical channels of the same sector. There is no information contained in the pilot other than the short PN code with a specific *offset* assigned to that particular sector. Remember from Chapter 3 that a

Ex. 2109 at p. 111.

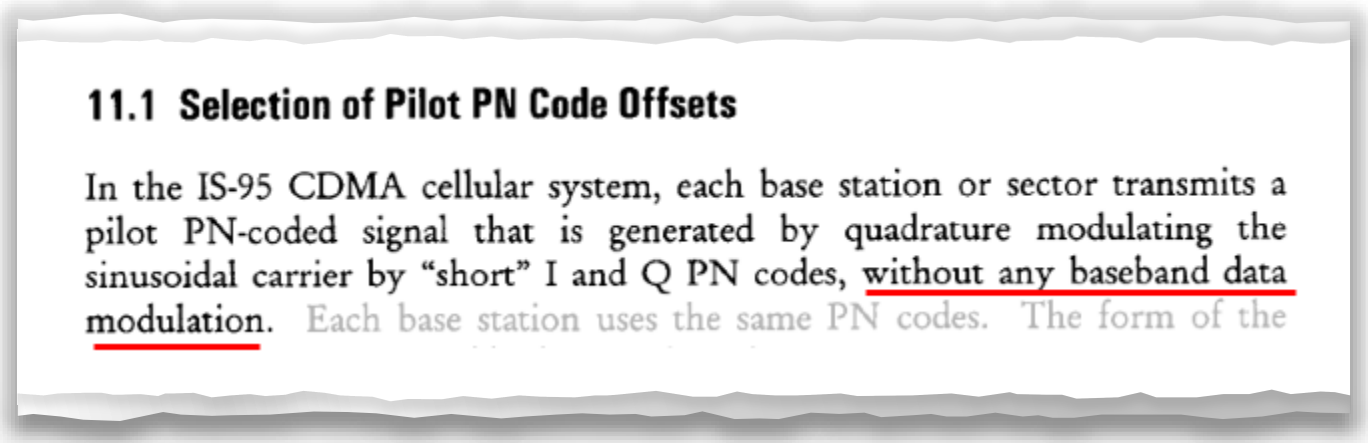


5.2.1 Pilot Channel

The pilot channel is identified by the Walsh function 0 (w_0). The channel itself contains no baseband information. The baseband sequence is a stream of 0s that are spread by Walsh function 0, which is also a sequence of all 0s. The resulting sequence (still all 0s) is then spread, or multiplied, by a pair of quadrature PN sequences. Therefore, the pilot channel is effectively the PN sequence itself (see Figure 5.1). The PN sequence with a specified offset uniquely identi-

Ex. 2109 at p. 118.

Ground 5: Claim 22 – PN code ≠ Common Data



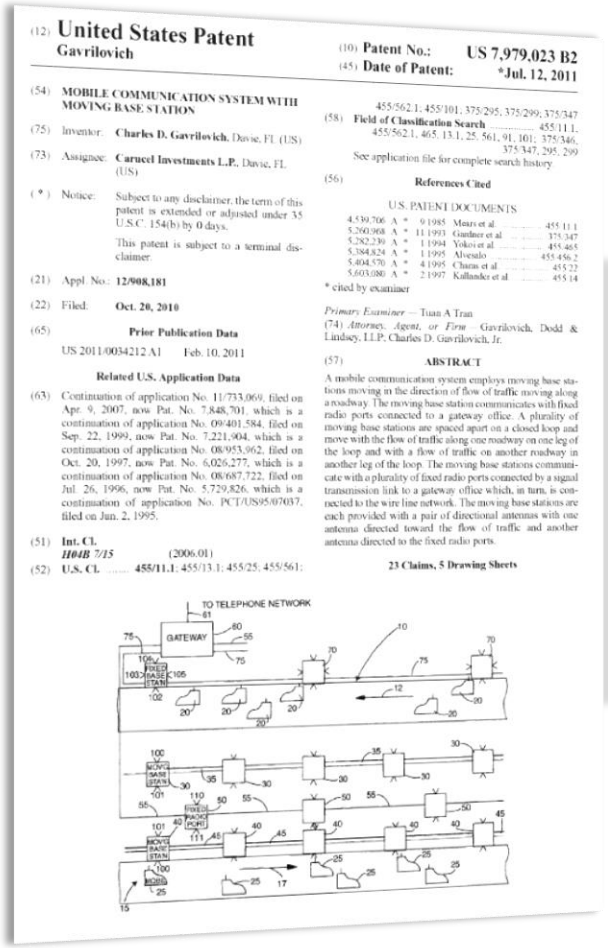
11.1 Selection of Pilot PN Code Offsets

In the IS-95 CDMA cellular system, each base station or sector transmits a pilot PN-coded signal that is generated by quadrature modulating the sinusoidal carrier by "short" I and Q PN codes, without any baseband data modulation. Each base station uses the same PN codes. The form of the

Ex. 2110 at p. 1112.

- If the PN codes were modulated with any "common data", as Petitioner proposes, mobile phones would not be able to decode it because it would be different than the predefined pilot code they all search for.
  - ➢As a result, the cellular network would not be able to operate.

Ground 5: *Thrower and Kaewell* with *Blakeney*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history.

(56) **References Cited**

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5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

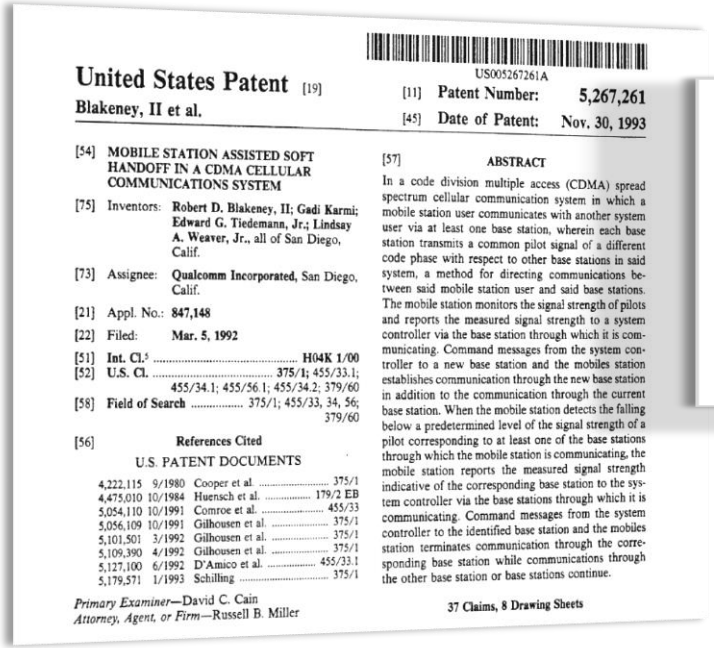
Dependent Claim 23

23. An apparatus in accordance with claim **22**, wherein transmission of each fixed port signal from each of the plurality of fixed ports is delayed by a different time and the receiver is configured to receive and separate the fixed port signals.

Ex. 1001, Claim 23.

Ground 5: Claim 23 – "Delayed by a Different Time"

- *Thrower*, *Kaewell* and *Blakeney* do not disclose or render obvious fixed port signals that are "Delayed by a different time."
- Instead, *Blakeney* only discloses the transmission of PN codes <u>with a different code phase offset</u>:



United States Patent [19]
Blakeney, II et al.

US005267261A
[11] Patent Number: 5,267,261
[45] Date of Patent: Nov. 30, 1993

[54] MOBILE STATION ASSISTED SOFT HANDOFF IN A CDMA CELLULAR COMMUNICATIONS SYSTEM

[75] Inventors: Robert D. Blakeney, II; Gadi Karmi; Edward G. Tiedemann, Jr.; Lindsay A. Weaver, Jr., all of San Diego, Calif.

[73] Assignee: Qualcomm Incorporated, San Diego, Calif.

[21] Appl. No.: 847,148

[22] Filed: Mar. 5, 1992

[51] Int. Cl.[5] H04K 1/00
[52] U.S. Cl. 375/1; 455/33.1; 455/34.1; 455/56.1; 455/34.2; 379/60
[58] Field of Search 375/1; 455/33, 34, 56; 379/60

[56] References Cited
U.S. PATENT DOCUMENTS

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5,109,390	4/1992	Gilhousen et al.	375/1
5,127,100	6/1992	D'Amico et al.	455/33.1
5,179,571	1/1993	Schilling	375/1

Primary Examiner—David C. Cain
Attorney, Agent, or Firm—Russell B. Miller

[57] ABSTRACT

In a code division multiple access (CDMA) spread spectrum cellular communication system in which a mobile station user communicates with another system user via at least one base station, wherein each base station transmits a common pilot signal of a different code phase with respect to other base stations in said system, a method for directing communications between said mobile station user and said base stations. The mobile station monitors the signal strength of pilots and reports the measured signal strength to a system controller via the base station through which it is communicating. Command messages from the system controller to a new base station and the mobiles station establishes communication through the new base station in addition to the communication through the current base station. When the mobile station detects the falling below a predetermined level of the signal strength of a pilot corresponding to at least one of the base stations through which the mobile station is communicating, the mobile station reports the measured signal strength indicative of the corresponding base station to the system controller via the base stations through which it is communicating. Command messages from the system controller to the identified base station and the mobiles station terminates communication through the corresponding base station while communications through the other base station or base stations continue.

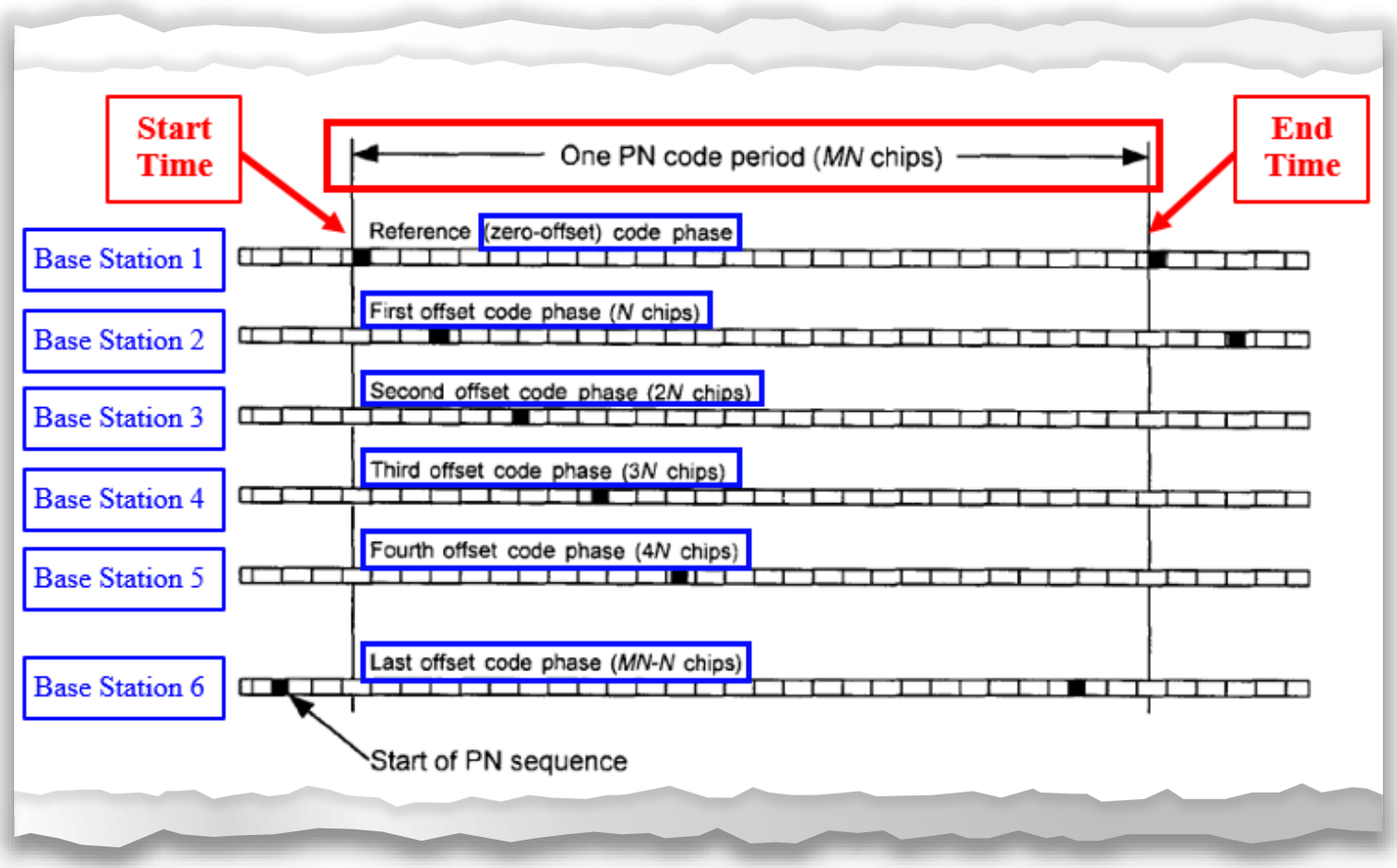
37 Claims, 8 Drawing Sheets

The pilot signal as transmitted by each base station is of the same PN spreading code but with a different code phase offset. For example, in the present invention the

Ex. 1012 at 6:17-20.

Ground 5: Claim 23 – PN code offsets ≠ Time Delay

- The two vertical lines are showing the start time and end time that all of the base stations are transmitting their PN codes.
- The rows represent different base stations.
- The black box on each row is showing the Code Phase.
- <u>Every row is transmitting at the same time as shown by the vertical line of the left</u>.



Ex. 2110 at p 1113.

Ground 5: Claim 23 – *Blakeney* is a Synchronized CDMA network

- a POSITA would have understood that *Blakeney's* CDMA system and its associated pilot codes are not "Delayed by a different time" with each other Because the CDMA network disclosed by *Blakeney* is synchronized:

4.1.2 System Time

While the maintenance of a systemwide time standard is not essential to the analog cellular system, it is a critical component of the CDMA digital cellular system design. Each base station of the IS-95 system is required to maintain a clock that is synchronized to GPS time signals. The known beginning of the GPS time count (time 00:00:00 on Jan. 6, 1980) is traceable to Universal

Ex. 2110 at p. 361.

Ground 5: Claim 23 – *Blakeney* is a Synchronized CDMA network

- This means each base station receives the same timing source, so they all will synchronized with each other.
  - ➢ therefore, each base station transmits the start of the pilot code at the same time and it is not skewed.
- If the pilot codes of *Blakeney* were actually "Delayed by a different time", the synchronous CDMA system disclosed by *Blakeney* would simply not work.

Patent Owner's Reply does not raise new arguments

- Patent Owner's Sur-Reply position—that the '023 Patent specification describes the invention as a whole and should be limited as such—is NOT a new argument:

> Claim terms are interpreted from the point of view of a person of ordinary skill in the art who "is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, **but in the context of the entire patent, including the specification**." *Id.* A disputed term should be construed by

Patent Owner Response (Paper 16) at p. 9.

Patent Owner's Reply does not raise new arguments

- the '023 Patent relates to and describes as a whole improving the wireless connections of mobile devices within cellular telephone systems via a moving base station–which is consistent with Patent Owner's construction of the term "mobile device":

D. "Mobile Devices" in the Context of the Entire '023 Patent

The '023 Patent discloses that the "moving telephone units", also known as cell phones or mobile phones, must be capable of registering with a cellular network to be able to receive calls coming from the cellular network. *Id.* at ¶¶60-64. As set

Patent Owner Response (Paper 16) at p. 7.

Patent Owner's Reply does not raise new arguments

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The '023 Patent discloses that the "moving telephone units", also known as cell phones or mobile phones, must be capable of registering with a cellular network to be able to receive calls coming from the cellular network. *Id.* at ¶¶60-64. As set

Patent Owner Response (Paper 16) at p. 7.

A mobile device must also be able to directly communicate with both the cellular network and a moving base station according to the invention as set forth in the specification. *Id.* at ¶¶60-64. The '023 Patent discloses that a mobile device can

Patent Owner Response (Paper 16) at p. 7.

Patent Owner's Reply does not raise new arguments

the "fixed ports." *See* Ex. 1001, 10:63-11:11. The '023 Patent specification also teaches that a mobile device must be capable of directly communicating with either a fixed cellular base station or a moving base station. *See, e.g.*, Ex. 1001, 4:48-51

Patent Owner Response (Paper 16) at p. 8.

Patent Owner requests construction of the term "mobile device" and submits that the plain and ordinary meaning of the term—"a device that must register with and be able to directly communicate with the cellular network"—be applied in this action. *See* Lanning Decl. ¶¶46-48.

Patent Owner Response (Paper 16) at p. 13.

Patent Owner's Reply does not raise new arguments

portable handset transceiver.'" (Petition at 27 citing Ex. 1003 at 4:13-17). While *Massa* does disclose a portable handset, *Massa* does not disclose a transmitter configured to transmit radio frequency signals to a portable handset that registers with or is capable of directly communicating with the cellular network as required by the limitation of a "mobile device" in the context of the entire '023 Patent. *See*

Patent Owner Response (Paper 16) at pp. 38-39.

Patent Owner's Reply does not raise new arguments

served.'" (Petition at 58 citing Ex. 1010 at 6:33-38) (emphasis in original). While *Thrower* does disclose personal telephones, *Thrower* does not disclose a transmitter configured to transmit radio frequency signals to a personal telephone that registers with or that is capable of directly communicating with the cellular network as required by the limitation of a "mobile device" in the context of the entire '023 Patent. *See Philips v. A.W.H. Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005).

Patent Owner Response (Paper 16) at pp. 56-57.

Patent Owner's Reply does not raise new arguments

- Patent Owner's additional Sur-Reply position—that neither *Massa* nor *Vogel* discloses a "controller" for Claim 16 in Ground 2—is also NOT a new argument:

> **2. Neither *Massa* nor *Toshiba* Disclose "A Controller Configured To . . . To Select A Best Signal" Required by Claim 16**
>
> Claim 16 further requires the element of "a controller configured . . . to select a best signal." (Ex. 1001, Col. 12, lns. 33-36). To satisfy this limitation, the Petitioner relies, incorrectly, on the combination of *Massa* and *Toshiba*. (*See* Petition at 34-35). However, neither *Massa* nor *Toshiba* disclose "a controller configured . . . to select **a best signal**" as required by Claim 16. (Ex. 1001, Col. 12, lns. 33-36 (emphasis added)).

Patent Owner Response (Paper 16) at p. 44-45.

Volkswagen Group of America, Inc.

Petitioner

v.

Carucel Investments, L.P.

Patent Owner

Case No. IPR2019-01103

U.S. Patent No. 7,979,023

VW GoA's Patentability Challenges of the '023 Patent

Ground	References	Basis	Claims Challenged
1	Ito and Gardner	§ 103	11, and 16-21
2	Ito, Gardner, and Gilhousen390	§ 103	22
3	Ito, Gardner, Gilhousen390, and Fenwick	§ 103	23
4	Gilhousen865 and Gilhousen390	§ 103	11, and 16-22
5	Gilhousen865, Gilhousen390, and Fenwick	§ 103	23

Petitioner's First Primary Reference – *Ito*

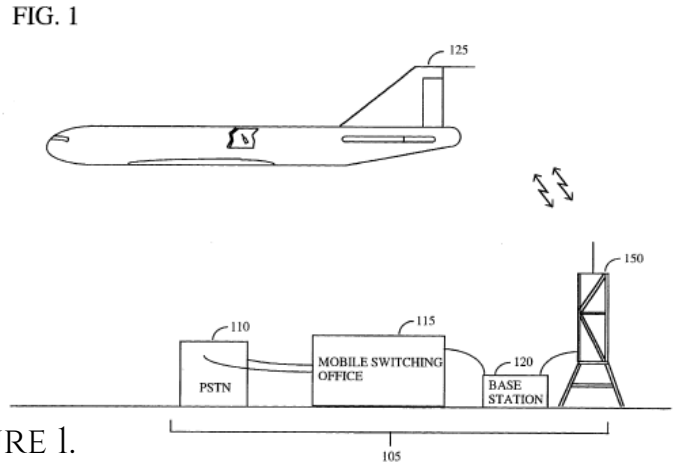
- The cellular type automobile telephone system was known in the art as a mobile radio communication system.
- The invention of *Ito* is not this pre-existing automobile telephone system.
- Instead, *Ito* is directed towards <u>improving the convenience of handsets for the automobile telephone system</u>.
  - *Ito* is only eliminating (1) the cord between the "automobile telephone unit," located in the trunk of a car and the cradle that holds the handset typically located around the dash of the vehicle; and (2) the curled cord used between the cradle and the handset with Ito's "mobile base device" in conjunction with Ito's "portable device."

Petitioner's Second Primary Reference – *Gilhousen865*

- *Gilhousen865* is directed towards improving the cellular radiotelephone communications between an airplane and a ground base station by overcoming specific issues that existed with the aircraft radiotelephone systems.
  - *Gilhousen865* is comprised of two subsystems: the ground based subsystem and the airborne based subsystem.

Petitioner's Second Primary Reference – *Gilhousen865*

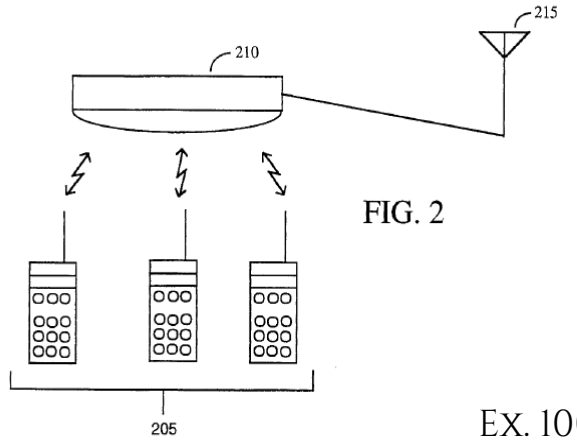
Ground Based Subsystem



Ex. 1009, Figure 1.

- The ground based subsystem includes a base station (120), a mobile switching center (115), an antenna (150), and the public switched telephone network (110)

Airborne Based Subsystem



Ex. 1009, Figure 2.

- The airborne based subsystem includes a radiotelephone (205), a radiotelephone signal repeater (210) and an antenna (215) that is mounted on the outside of the aircraft

Primary Reasons Carucel Should Prevail

- No motivation to combine Petitioner's prior art references
  - Petitioner's proposed combinations either result in inoperable devices or suffer from critical capability issues.
- Grounds 1 – 3
  - *Ito* Does Not Disclose "A Mobile Device" Required by Claims 11 and 16-21.
  - Neither *Ito* Nor *Gardner* disclose "a controller configured . . . to select a best signal" required by Claim 16.

Primary Reasons Carucel Should Prevail

- Grounds 4 – 5
  - *Gilhousen865* fails to disclose "configured to" required by Claims 11 and 16-22
  - *Gilhousen865* Fails to Disclose "A Mobile Device" Required by Claims 11 and 16-22.
  - *Gilhousen865* Fails to Disclose "automotive vehicle" Required by Claim 20.

No Motivation to Combine the Prior Art References

Grounds 1 – 3: *Ito* with *Gardner*

- A POSITA would not have been motivated to combine *Ito* with *Gardner* because such a combination would result in an inoperable device
  - If a POSITA were to simply replace the single antenna of the "automobile telephone unit" of *Ito* with the spatially separated antennas of *Gardner*, this would result in an inoperable device because it would be unable to correctly receive or process any signals from the spatially separated antennas.
- Petitioner's proposed combination would also require much new circuitry not disclosed in either *Ito* or *Gardner*.

No Motivation to Combine the Prior Art References

McGinley v. Franklin Sports, Inc.

"If references taken in combination would produce a 'seemingly inoperative device,' such references teach away from the combination and thus cannot serve as predicates for a *prima facie* case of obviousness."

McGinley v. Franklin Sports, Inc., 262 F.3d 1339, 1354 (Fed. Cir. 2001).

No Motivation to Combine the Prior Art References

Ground 2: *Ito* and *Gardner* with *Gilhousen390*

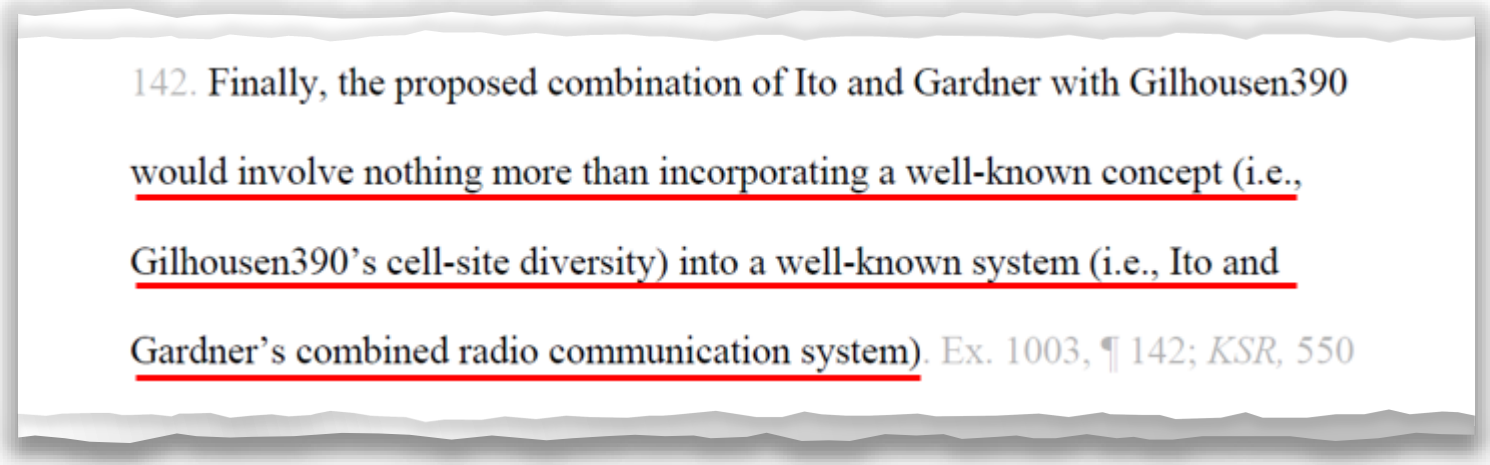
- A POSITA would not have been motivated to modify *Ito* with *Gilhousen390* because of the critical compatibility issues that would arise when trying to implement *Gilhousen390's* CDMA functionality into *Ito's* FDMA/TDMA system.

- FDMA/TDMA systems are not compatible with Code Division Multiple Access (CDMA) Systems because their wireless interfaces use different technology.

  - *Ito's* system is designed to utilize FDMA/TDMA protocols.

  - *Gilhousen390's* system is designed to utilize CDMA protocols.

Ground 2: No Motivation to Combine



142. Finally, the proposed combination of Ito and Gardner with Gilhousen390 would involve nothing more than incorporating a well-known concept (i.e., Gilhousen390's cell-site diversity) into a well-known system (i.e., Ito and Gardner's combined radio communication system). Ex. 1003, ¶ 142; *KSR*, 550

Petition at p. 45.

- If CDMA functionality was so "well-known" and interchangeable with FDMA/TDMA then why hasn't any major wireless company successfully done so to create a new wireless generation standard?
- Why did the major wireless companies ultimately stray away from CDMA and TDMA systems in 2006 to create the fourth generation standard—the LTE 4G network—if such interchangeability truly exists?

Ground 2: *Ito* with *Gilhousen390*

- The answer is simple: "these systems could not be interfaced."

Deposition Testimony of Carucel's Expert

So to me it supports my point is that these systems could not be interfaced and people spent, when I say people a lot of companies have spent a lot of money trying to do this. And at the end of the day, they stayed with the standard CDMA networks, the standard GSM networks until 19 -- until 2006, when the LTE 4G network standard and they actually got away from CDMA and TDMA in order to get a fourth generation standard.

Ex. 1039, 266:4-12.

No Motivation to Combine the Asserted Prior Art References

Grounds 4-5: *Gilhousen865* with *Gilhousen390*

- A POSITA would not have been motivated to combine *Gilhousen390* with *Gilhousen865* because the combination would suffer from the same issues that the *Gilhousen865* invention was attempting to overcome:
  - "[T]he aircraft radiotelephone system does not perform hand-offs . . . . [and] results in the call from the aircraft radiotelephone being dropped when the aircraft reaches the limit of the cell's coverage."

No Motivation to Combine
Grounds 4-5: Gilhousen865 with Gilhousen390

- *Gilhousen390's* CDMA signal diversity configurations will not work if employed on *Gilhousen865's* high speed airborne repeater.
  - Due to the high speeds of *Gilhousen865's* airborne repeater, the power control commands will not be able to keep up and, if *Gilhousen865's* airborne repeater is moving away from the base station, the call from the aircraft radiotelephone will eventually be dropped.
  - As a result, at 500 MPH a commercial jet is travelling 10 times faster than the maximum speed than the *Gilhousen390* system can support.

No Motivation to Combine Grounds 4-5: *Gilhousen865* with *Gilhousen390*

- Patent Owner's presumed speed of a commercial jet—500 mph—is not "significantly exaggerated."

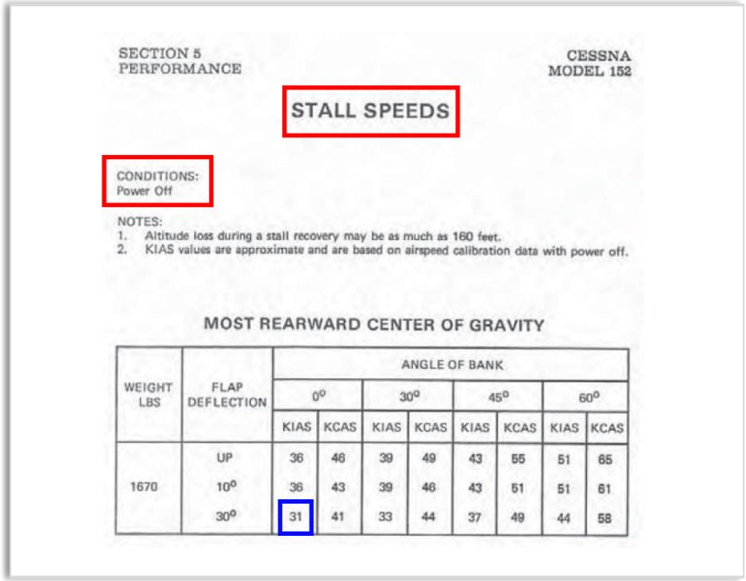
- First, a POSITA would not consider the Cessna 152 as an "exemplary" airplane contemplated by *Gilhousen865*

  - the Cessna 152 went out of production in 1985—nine years before the filing date of *Gilhousen865*.

- Second, the Cessna 152's cruising speed is "107 knots" (~123mph) —which is nearly 2.5 times faster than the maximum speed than the Gilhousen390 system can support.

No Motivation to Combine Grounds 4-5: *Gilhousen865* with *Gilhousen390*

- Third, even if a POSITA would consider a Cessna 152 as an exemplary airplane (which it would not), the power of the Cessna 152 would have to be off in order for its airspeed to be less than the maximum speed that the Gilhousen390 system can support (i.e., 50 MPH)
  - ➢ the Cessna 152 was capable of lower speeds (i.e., 31-44 knots) when the power of the Cessna 152 is OFF (i.e., no engine power):



SECTION 5
PERFORMANCE

CESSNA
MODEL 152

STALL SPEEDS

CONDITIONS:
Power Off

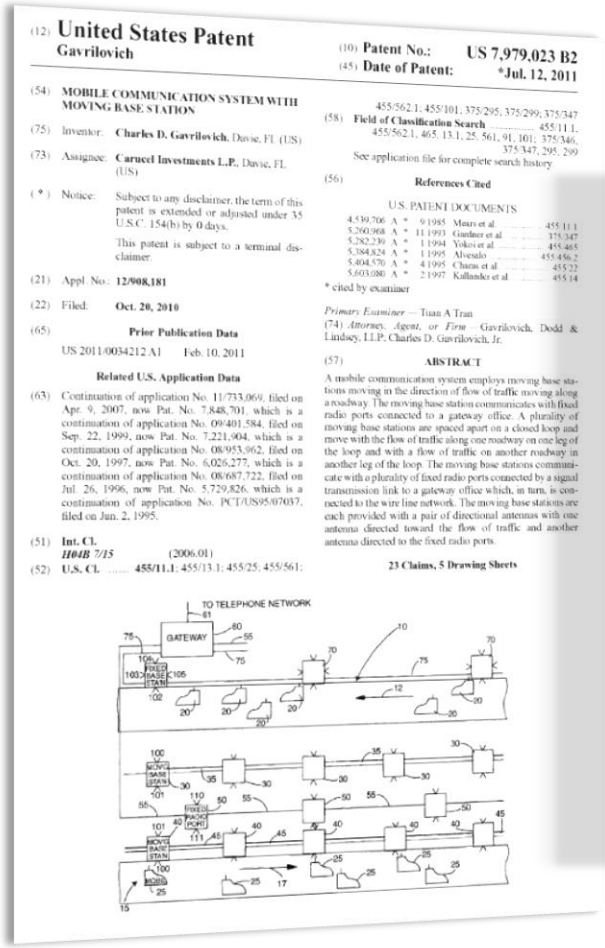
NOTES:
1. Altitude loss during a stall recovery may be as much as 160 feet.
2. KIAS values are approximate and are based on airspeed calibration data with power off.

MOST REARWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
1670	UP	36	46	39	49	43	55	51	65
	10°	36	43	39	46	43	51	51	61
	30°	31	41	33	44	37	49	44	58

Ex. 1037 at 69.

Ground 1: *Ito* with *Gardner*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history

(56) **References Cited**

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5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,239	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Independent Claim 11

11. An apparatus configured to move relative to Earth, the apparatus comprising:

a plurality of spatially separated antennas; and

a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas; and

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

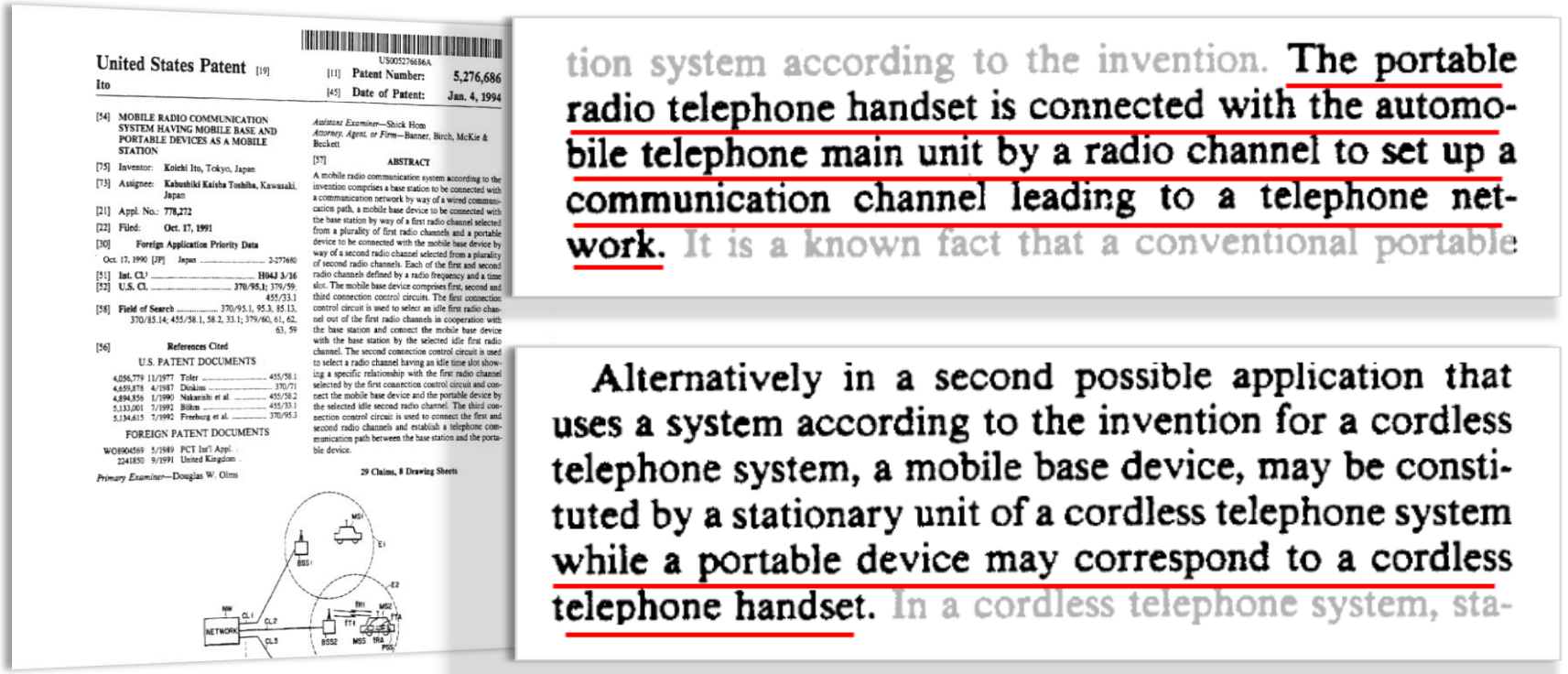
Ex. 1001, Claim 11.

Ground 1: Claim 11 – "A Mobile Device"

- *Ito* and *Gardner* do not disclose or render obvious "a mobile device" in the context of the entire '023 Patent
  - *Ito* does not disclose That its portable device is capable of directly communicating with a fixed cellular base station; and
  - *Ito* does not disclose That its portable device is capable of capable of registering with a cellular network.

Ground 1: Claim 11 – "A Mobile Device"

- Instead, *Ito* only discloses That its portable device is only able to communicate with a cellular network through *Ito's* mobile base device:



United States Patent [19]
Ito

[11] Patent Number: 5,276,686
[45] Date of Patent: Jan. 4, 1994

[54] MOBILE RADIO COMMUNICATION SYSTEM HAVING MOBILE BASE AND PORTABLE DEVICES AS A MOBILE STATION

[75] Inventor: Koichi Ito, Tokyo, Japan
[73] Assignee: Kabushiki Kaisha Toshiba, Kawasaki, Japan
[21] Appl. No.: 778,272
[22] Filed: Oct. 17, 1991
[30] Foreign Application Priority Data
Oct. 17, 1990 [JP] Japan 2-277680
[51] Int. Cl.[5] H04J 3/16
[52] U.S. Cl. 370/95.1; 379/59; 455/33.1
[58] Field of Search 370/95.1, 95.3, 85.13, 370/85.14; 455/58.1, 58.2, 33.1; 379/60, 61, 62, 63, 59

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2241850	9/1991	United Kingdom .

Primary Examiner—Douglas W. Olms
Assistant Examiner—Shick Hom
Attorney, Agent, or Firm—Banner, Birch, McKie & Beckett

[57] ABSTRACT

A mobile radio communication system according to the invention comprises a base station to be connected with a communication network by way of a wired communication path, a mobile base device to be connected with the base station by way of a first radio channel selected from a plurality of first radio channels and a portable device to be connected with the mobile base device by way of a second radio channel selected from a plurality of second radio channels. Each of the first and second radio channels defined by a radio frequency and a time slot. The mobile base device comprises first, second and third connection control circuits. The first connection control circuit is used to select an idle first radio channel out of the first radio channels in cooperation with the base station and connect the mobile base device with the base station by the selected idle first radio channel. The second connection control circuit is used to select a radio channel having an idle time slot showing a specific relationship with the first radio channel selected by the first connection control circuit and connect the mobile base device and the portable device by the selected idle second radio channel. The third connection control circuit is used to connect the first and second radio channels and establish a telephone communication path between the base station and the portable device.

29 Claims, 8 Drawing Sheets

tion system according to the invention. **The portable radio telephone handset is connected with the automobile telephone main unit by a radio channel to set up a communication channel leading to a telephone network.** It is a known fact that a conventional portable

Ex. 1005, 3:23-27.

Alternatively in a second possible application that uses a system according to the invention for a cordless telephone system, a mobile base device, may be constituted by a stationary unit of a cordless telephone system while a portable device may correspond to a cordless telephone handset. In a cordless telephone system, sta-

Ex. 1005, 3:36-41.

Ground 1: Claim 11 – "A Mobile Device"

- Figure 1 is a schematic view of the mobile radio communication system of the *Ito* invention.
- Figure 1 labels the signals between *Ito's* base station [BSS] and *Ito's* mobile base device [MSS] as "**fR1**" and "**fT1**".
- In contrast, Figure 1 labels the signals between *Ito's* mobile base device [MSS] to *Ito's* portable device [PSS] as "**fRA**" and "**fTA**".
- Figure 1 does not disclose any direct communication between *Ito's* BSS and Ito's *PSS.*

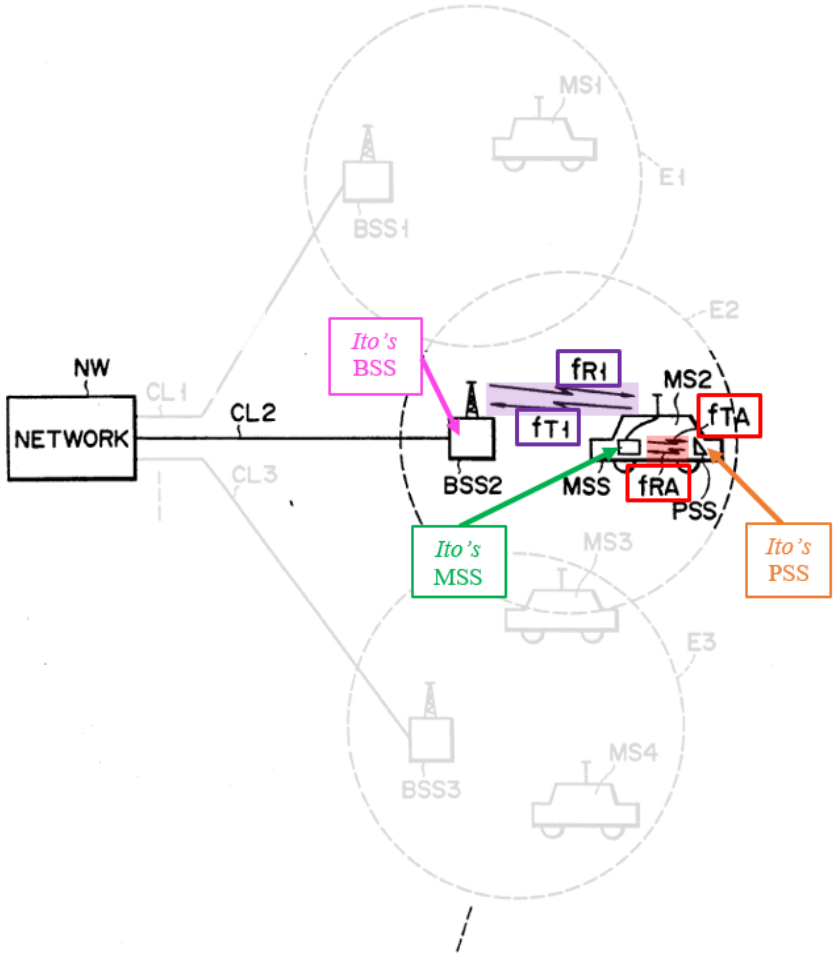
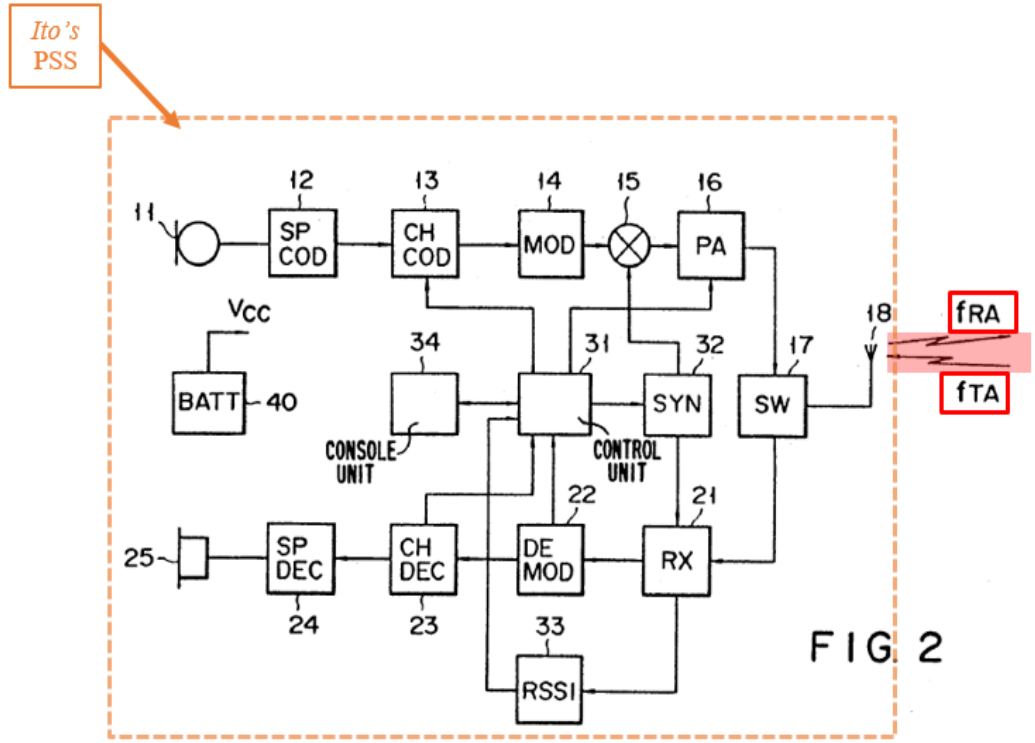


FIG. 1

Ex. 1005, Figure 1.

Ground 1: Claim 11 – "A Mobile Device"

- Figure 2 is a block diagram of *Ito's* portable device [PSS] of Figure 1.
- Figure 2 labels the signals transmitted by and/or received at antenna (18) of *Ito's* PSS as "**fRA**" and "**fTA**".
  - Identified in Figure 1 as the signals between *Ito's* MSS and *Ito's* PSS.
- Figure 2 does not disclose any direct communication between *Ito's* BSS and *Ito's* PSS.



Ex. 1005, Figure 2.

Ground 1: Claim 11 – "A Mobile Device"

- Figure 3 is a block diagram of *Ito's* mobile base device [MSS] of Figure 1.
- Figure 3 labels the signals transmitted by and/or received at antenna (58) of *Ito's* MSS are labeled as "**fR1**" and "**fT1**".
  - Identified in Figure 1 as the signals between *Ito's* BSS and *Ito's* MSS .
  - Figure 3 labels the signals transmitted by and/or received at antenna (88) of *Ito's* MSS are labeled as "**fRA**" and "**fTA**".
  - Identified in Figure 1 as the signals between *Ito's* MSS and *Ito's* PSS.
- Figure 3 does not disclose any direct communication between *Ito's* BSS and *Ito's* PSS.

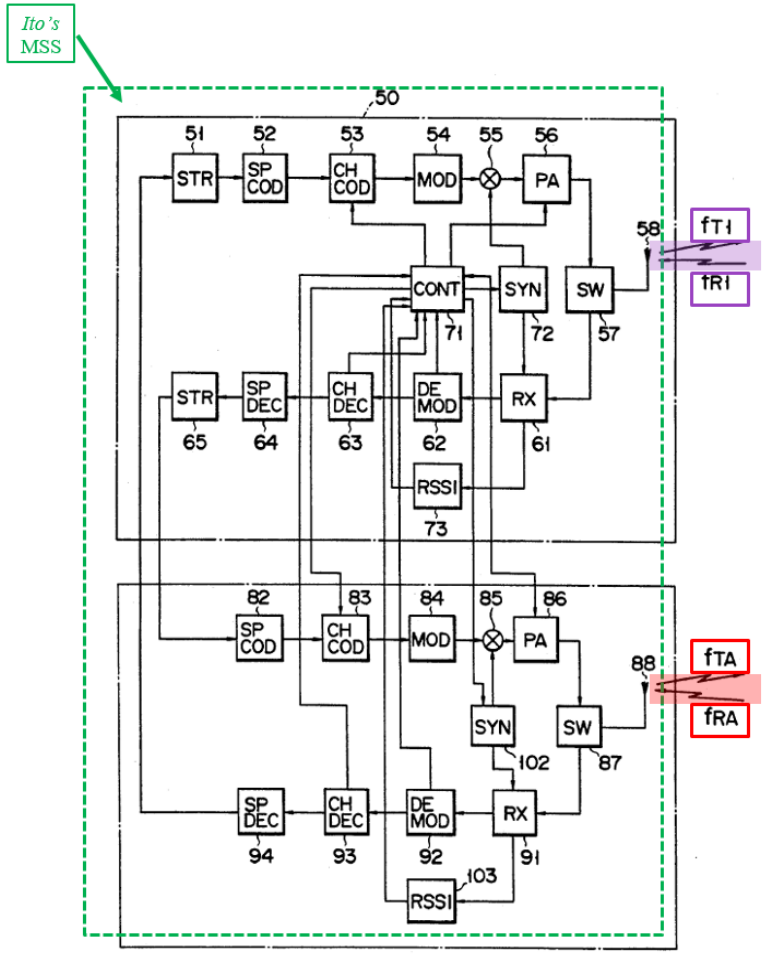
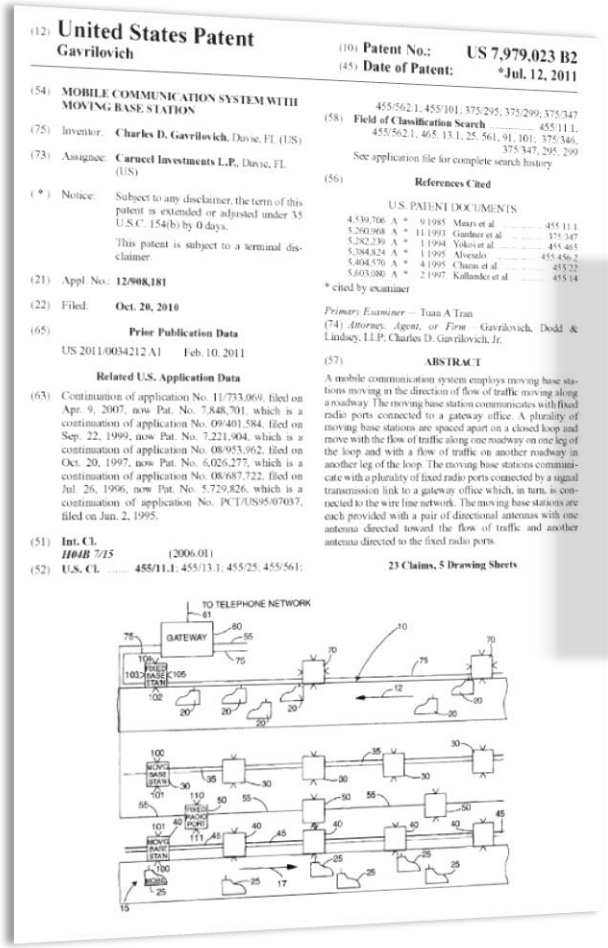


FIG. 3

Ex. 1005, Figure 3.

Ground 1: *Ito with Gardner*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history

(56) **References Cited**

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5,282,239	A *	1/1994	Yokoi et al.	455/465
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* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

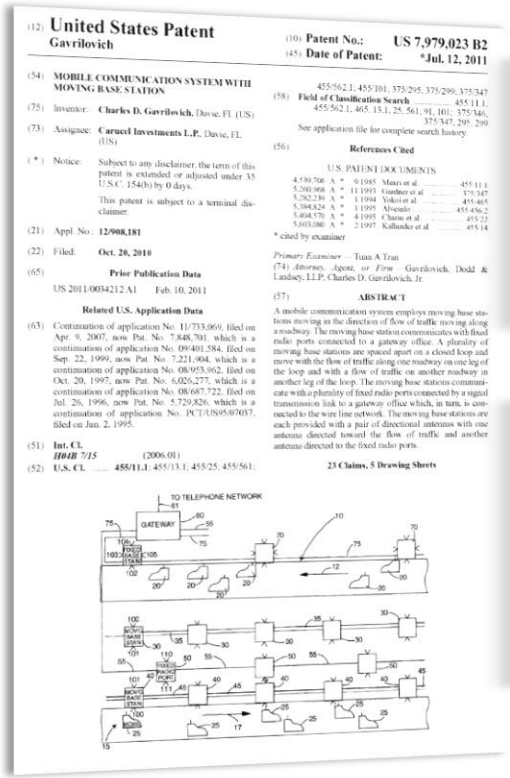
Dependent Claim 16

16. An apparatus in accordance with claim **11**, further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.

Ex. 1001, Claim 16.

Ground 1: Claim 16 – *"To Select a best signal"*

- the '023 Patent specification requires "best signal" to include an analysis of the signal quality (i.e., error rate) in addition to the signal strength:



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455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

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23 Claims, 5 Drawing Sheets

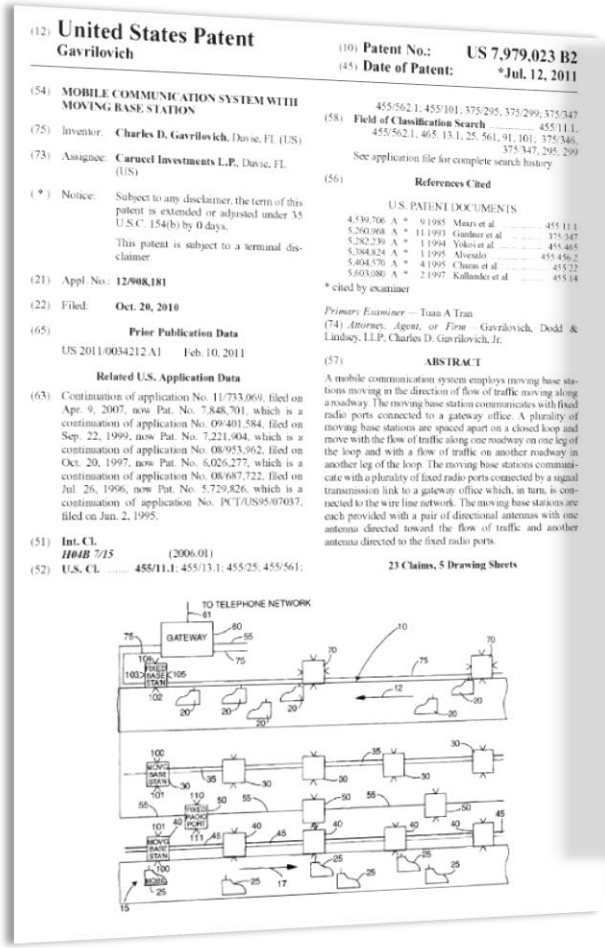
on the received signal. The signal quality indication is a figure of merit preferably computed as a function of signal strength and signal-to-noise ratio. It is added to the received data and

Ex. 1001, 10:13-15.

TDM frame errors. The best data, i.e., associated with the best signal quality indication is transferred from the gateway **60** to the telephone network. Data received from the telephone

Ex. 1001, 10:32-34.

Ground 1: Claim 16 – *"To Select a best signal"*



(12) **United States Patent**
Gavrilovich

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(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history

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5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

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23 Claims, 5 Drawing Sheets

station and a moving base station. The procedures for determining whether a mobile unit is to be served by a fixed base station or a moving base station are the same procedures as described earlier herein in determining which moving base station is selected to serve a mobile unit, i.e., based on signal strength and error rate. Thus, when a call involving a mobile unit is initiated or when it is determined that a handoff should occur, the mobile unit may be handed from a moving station to a fixed station, or vice versa. Each mobile unit monitors pilot signals from fixed and moving base stations and synchronizes to the base station providing the best signal. The

Ex. 1001, 11:3-13.

Ground 1: Claim 16 – Strongest Signal ≠ "Best Signal"

- A POSITA would understand that the '023 Patent specification requires "best signal" to include an analysis of both the signal quality (i.e., error rate) and the signal strength:

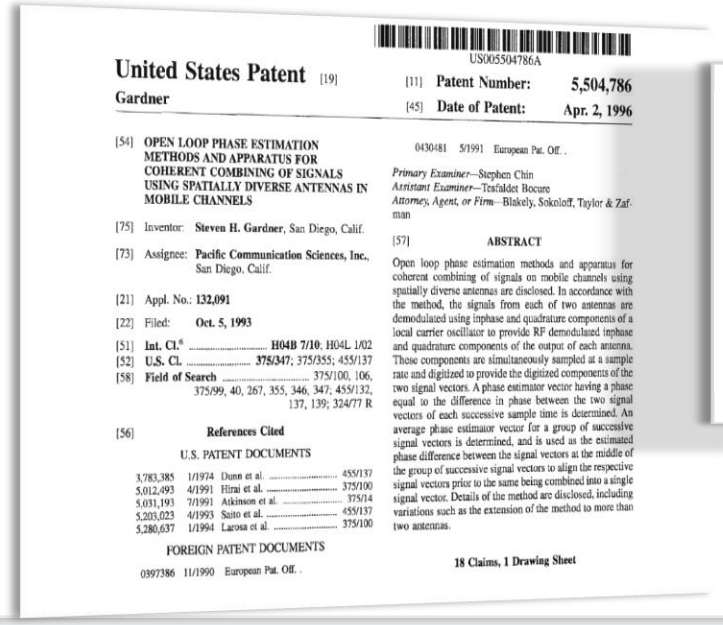
Testimony of Carucel's Expert

A In Claim 16, it's the moveable base station that's determining the best signal. From 11, it's the mobile unit that is determining the best signal. But independent of which device is making the determination, the '023 patent is clear that signal strength and error rate is what's used to determine best signal.

IPR2019-01103, Ex. 1040, 422:15-21.

Ground 1: Claim 16 – *"To Select a best signal"*

- *Ito* and *Gardner* do not disclose or render obvious "a controller configured . . . to select a best signal."
- Instead, *Gardner* only discloses the method of "selection diversity" which "cho[oses] the antenna that provides the strongest signal":



US005504786A

United States Patent [19]
Gardner

[11] **Patent Number: 5,504,786**
[45] **Date of Patent: Apr. 2, 1996**

[54] **OPEN LOOP PHASE ESTIMATION METHODS AND APPARATUS FOR COHERENT COMBINING OF SIGNALS USING SPATIALLY DIVERSE ANTENNAS IN MOBILE CHANNELS**

[75] Inventor: **Steven H. Gardner**, San Diego, Calif.

[73] Assignee: **Pacific Communication Sciences, Inc.**, San Diego, Calif.

[21] Appl. No.: **132,091**

[22] Filed: **Oct. 5, 1993**

[51] **Int. Cl.**[6] **H04B 7/10**; H04L 1/02
[52] **U.S. Cl.** **375/347**; 375/355; 455/137
[58] **Field of Search** ..... 375/100, 106, 375/99, 40, 267, 355, 346, 347; 455/132, 137, 139; 324/77 R

[56] **References Cited**

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5,203,023	4/1993	Saito et al.	455/137
5,280,637	1/1994	Larosa et al.	375/100

FOREIGN PATENT DOCUMENTS

0397386	11/1990	European Pat. Off. .
0430481	5/1991	European Pat. Off. .

Primary Examiner—Stephen Chin
Assistant Examiner—Tesfaldet Bocure
Attorney, Agent, or Firm—Blakely, Sokoloff, Taylor & Zafman

[57] **ABSTRACT**

Open loop phase estimation methods and apparatus for coherent combining of signals on mobile channels using spatially diverse antennas are disclosed. In accordance with the method, the signals from each of two antennas are demodulated using inphase and quadrature components of a local carrier oscillator to provide RF demodulated inphase and quadrature components of the output of each antenna. Those components are simultaneously sampled at a sample rate and digitized to provide the digitized components of the two signal vectors. A phase estimator vector having a phase equal to the difference in phase between the two signal vectors of each successive sample time is determined. An average phase estimator vector for a group of successive signal vectors is determined, and is used as the estimated phase difference between the signal vectors at the middle of the group of successive signal vectors to align the respective signal vectors prior to the same being combined into a single signal vector. Details of the method are disclosed, including variations such as the extension of the method to more than two antennas.

18 Claims, 1 Drawing Sheet

There are many well known schemes for making use of the signals from the two antennas. The simplest of these is to just chose the antenna that provides the strongest signal. This is referred to as selection diversity. The best performing

Ex. 1006, 17:5-11.

Ground 1: Claim 16 – Strongest Signal ≠ "Best Signal"

- In stark contrast, a POSITA would understand that the strongest signal is not always the "best signal":

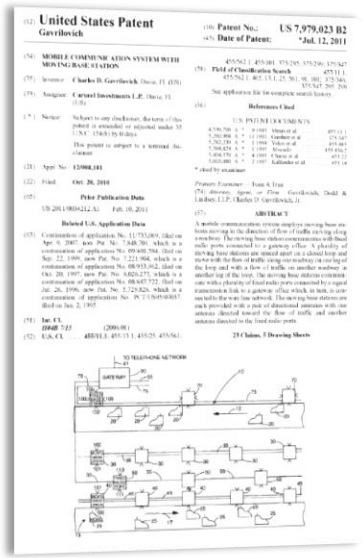
Testimony of Carucel's Expert

provide any evidentiary support for his conclusory assertion. Based upon my experience, the strongest signal may not be the best signal received by the mobile phone, as Mr. Denning opines, because the strongest received signal may not be coming from the correct cellular network operator or the strongest signal may have some type of distortion that would cause errors in the data being received.

IPR2019-01103, Ex. 2100 at ¶ 154.

Ground 1: *Ito with Gardner*

Dependent Claims 19 - 21



19. An apparatus in accordance with claim **11**, wherein the apparatus is conveyed by a vehicle.

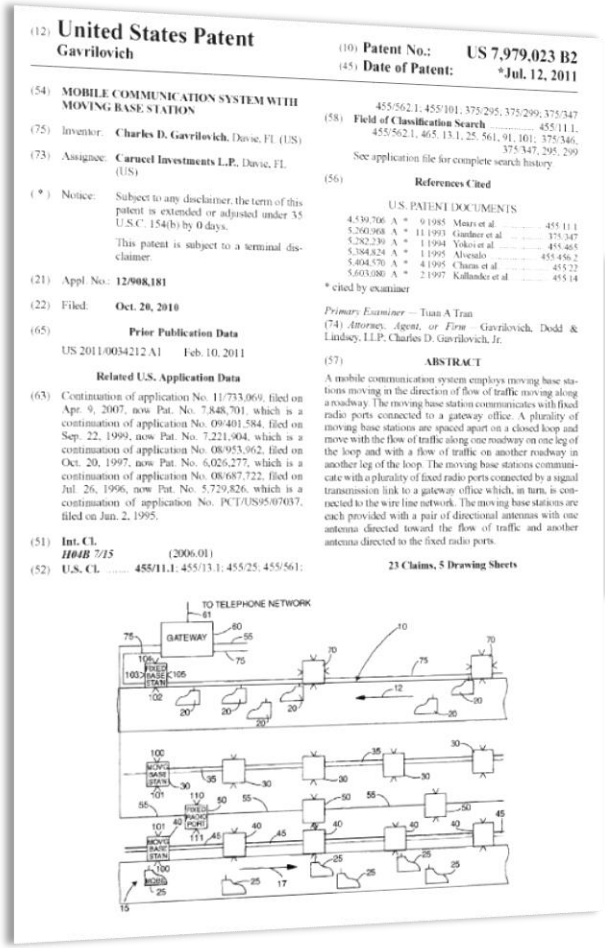
20. An apparatus in accordance with claim **19**, wherein the vehicle is an automotive vehicle.

21. An apparatus in accordance with claim **11**, wherein the receiver is further configured to receive fixed port signals from a plurality of fixed ports through the plurality of spatially separated antennas.

Ex. 1001, Claims 19-21.

- Since the Petition fails to show that *Ito* in combination with *Gardner* renders obvious all limitations of Claim 11, its challenges to Claims 19-21 fail for the same reasons.

Ground 2: *Ito* and *Gardner* with *Gilhousen390*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history.

(56) **References Cited**

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5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,239	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Dependent Claim 22

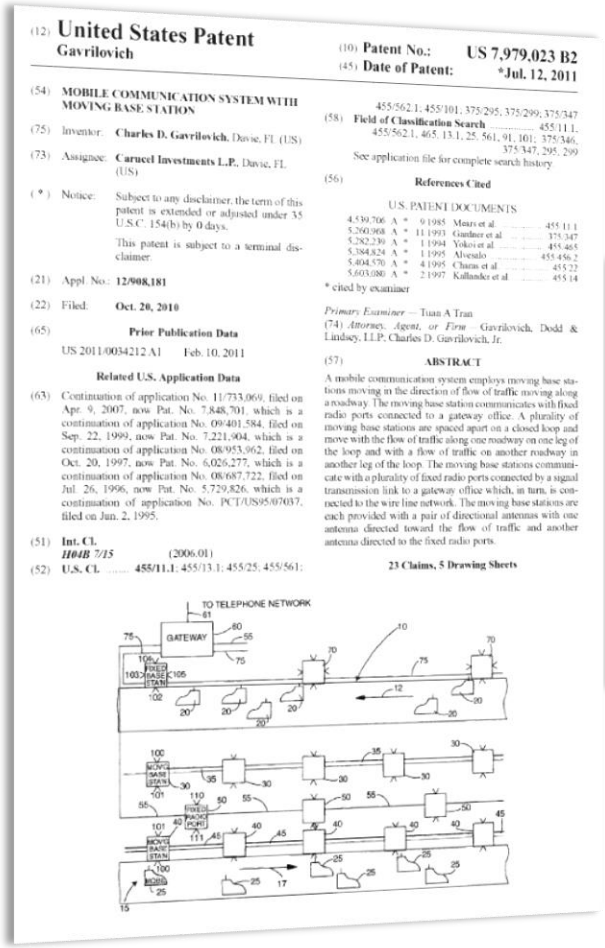
22. An apparatus in accordance with claim **21**, wherein each fixed port signal transmitted from each of the plurality of fixed ports includes common data.

Ex. 1001, Claim 22.

Ground 2: Dependent Claim 22

- Since the Petition fails to show that *Ito* in combination with *Gardner* renders obvious all limitations of Claim 11, its challenges to Claim 22 fails for the same reasons.
- incorporates at least the limitation from independent Claim 11 of "a mobile device."
  - *Gilhousen390* is not used by the Petitioner or Mr. Denning to disclose "a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals."
  - Instead, Petitioner merely alleges that *Gilhousen390* "describes a cell-site diversity configuration in which the receiving device simultaneously receives signals from multiple base stations."

Ground 3: *Ito, Gardner* and *Gilhousen390* with *Fenwick*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

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23 Claims, 5 Drawing Sheets

Dependent Claim 23

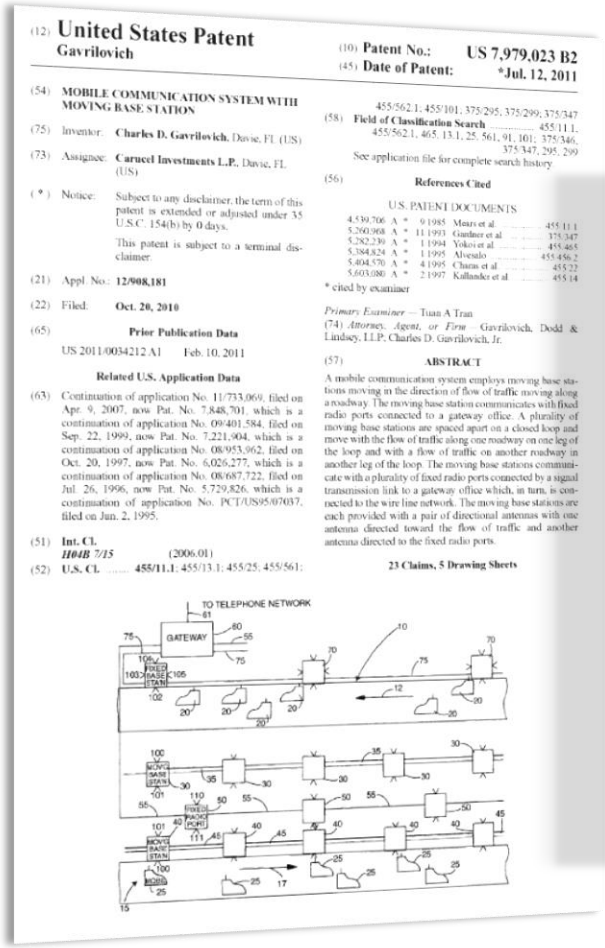
23. An apparatus in accordance with claim **22**, wherein transmission of each fixed port signal from each of the plurality of fixed ports is delayed by a different time and the receiver is configured to receive and separate the fixed port signals.

Ex. 1001, Claim 23.

Ground 3: Dependent Claim 23

- Since the Petition fails to show that *Ito* in combination with *Gardner* renders obvious all limitations of Claim 11, its challenges to 23 fail for the same reasons.
- Claim 23 of the '023 Patent indirectly depends from independent Claim 11 and therefore, incorporates at least the limitation from independent Claim 11 of "a mobile device."
  - As previously demonstrated in Ground 2, *Ito*, *Gardner* and *Gilhousen390* do not disclose or render obvious "a mobile device."
  - *Fenwick* is not used by the Petitioner or Mr. Denning to satisfy the limitation of "a mobile device."
  - Instead, Petitioner merely alleges that *Fenwick* describes a time diversity configuration in which the signals are repeatedly transmitted with a time delay between each transmission.

Ground 4: *Gilhousen865* with *Gilhousen390*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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(51) **Int. Cl.**
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(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history

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Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

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A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Independent Claim 11

11. An apparatus configured to move relative to Earth, the apparatus comprising:

a plurality of spatially separated antennas; and

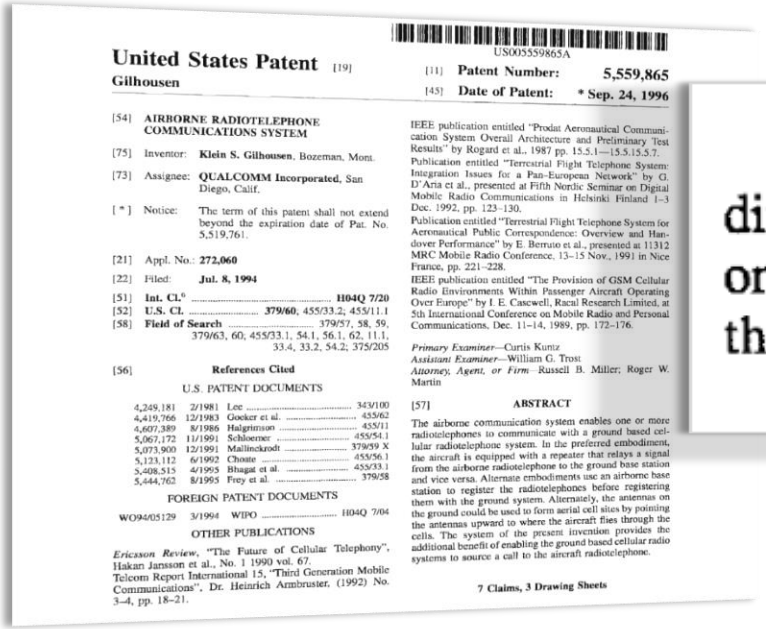
a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas; and

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

Ex. 1001, Claim 11.

Ground 4: Claim 11 – "Configured To"

- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious "an apparatus configured to move relative to Earth" in the context of the entire '023 Patent.
- Instead, *Gilhousen865* only discloses repeater that is installed on an airplane:



US005559865A

United States Patent [19]
Gilhousen

[11] **Patent Number: 5,559,865**
[45] **Date of Patent: * Sep. 24, 1996**

[54] **AIRBORNE RADIOTELEPHONE COMMUNICATIONS SYSTEM**

[75] Inventor: **Klein S. Gilhousen**, Bozeman, Mont.

[73] Assignee: **QUALCOMM Incorporated**, San Diego, Calif.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,519,761.

[21] Appl. No.: **272,060**

[22] Filed: **Jul. 8, 1994**

[51] **Int. Cl.**[6] **H04Q 7/20**
[52] **U.S. Cl.** **379/60**, 455/33.2; 455/11.1
[58] **Field of Search** 379/57, 58, 59, 379/63, 60; 455/33.1, 54.1, 56.1, 62, 11.1, 33.4, 33.2, 54.2; 375/205

[56] **References Cited**

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4,607,389	8/1986	Halgrimson	455/11
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5,073,900	12/1991	Mallinckrodt	379/59 X
5,123,112	6/1992	Choate	455/56.1
5,408,515	4/1995	Bhagat et al.	455/33.1
5,444,762	8/1995	Frey et al.	379/58

FOREIGN PATENT DOCUMENTS

WO94/05129	3/1994	WIPO	H04Q 7/04

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Telcom Report International 15, "Third Generation Mobile Communications", Dr. Heinrich Armbruster, (1992) No. 3–4, pp. 18–21.
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Primary Examiner—Curtis Kuntz
Assistant Examiner—William G. Trost
Attorney, Agent, or Firm—Russell B. Miller; Roger W. Martin

[57] **ABSTRACT**

The airborne communication system enables one or more radiotelephones to communicate with a ground based cellular radiotelephone system. In the preferred embodiment, the aircraft is equipped with a repeater that relays a signal from the airborne radiotelephone to the ground base station and vice versa. Alternate embodiments use an airborne base station to register the radiotelephones before registering them with the ground system. Alternately, the antennas on the ground could be used to form aerial cell sites by pointing the antennas upward to where the aircraft flies through the cells. The system of the present invention provides the additional benefit of enabling the ground based cellular radio systems to source a call to the aircraft radiotelephone.

7 Claims, 3 Drawing Sheets

The airborne subsystem also operates in the reverse direction. 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.

Ex. 1009,2:53-63.

Ground 4: Claim 11 – "Configured to"

- Because *Gilhousen865's* repeater is installed in an airplane, Petitioner contends that the repeater is "configured to move relative to Earth."

  - Petitioner has failed to account for the construction of the term "configured to" as set forth by the civil court and supported by the '023 Patent specification—"constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic."

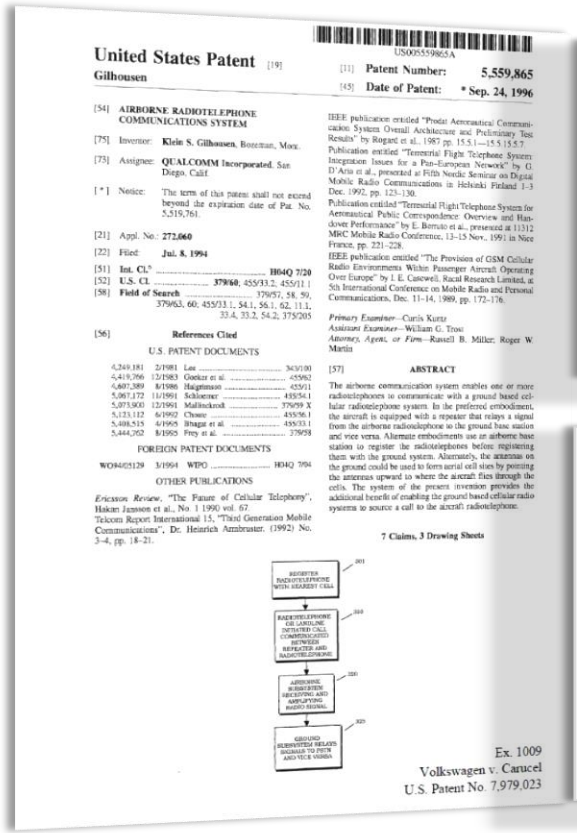
  - Traffic or rate of speed of traffic, as used in the '023 Patent and construed by the civil court, is referring to "an automotive vehicle traveling on a roadway," not "airplane traffic"

Ground 4: Claim 11 – "Configured to"

- An airplane does not satisfy the requirements of "an apparatus configured to move relative to Earth" in the context of the entire '023 Patent:
  - An airplane does not move with traffic as it is not bound to predetermined roads.
  - an airplane can travel at speeds up to five hundred miles-per-hour and, as such, does not move with the traffic at a rate of speed which is comparable to the traffic.

Ground 4: Claim 11 – *Gilhousen865* is Unique to Airplanes

- The invention of *Gilhousen865* is unique to airplanes and is not applicable to other vehicles, such as automobiles:



United States Patent [19]
Gilhousen

US005559865A
[11] Patent Number: 5,559,865
[45] Date of Patent: * Sep. 24, 1996

[54] AIRBORNE RADIOTELEPHONE COMMUNICATIONS SYSTEM

[75] Inventor: Klein S. Gilhousen, Bozeman, Mont.

[73] Assignee: QUALCOMM Incorporated, San Diego, Calif.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,519,761.

[21] Appl. No.: 272,060

[22] Filed: Jul. 8, 1994

[51] Int. Cl.[6] H04Q 7/20
[52] U.S. Cl. 379/60; 455/33.2; 455/11.1
[58] Field of Search 379/57, 58, 59, 379/63, 60; 455/33.1, 54.1, 56.1, 62, 11.1, 33.4, 33.2, 54.2; 375/205

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WO94/05129	3/1994	WIPO	H04Q 7/04

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Assistant Examiner—William G. Trost
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7 Claims, 3 Drawing Sheets

Ex. 1009
Volkswagen v. Carucel
U.S. Patent No. 7,979,023

[57] **ABSTRACT**

The airborne communication system enables one or more radiotelephones to communicate with a ground based cellular radiotelephone system. In the preferred embodiment,

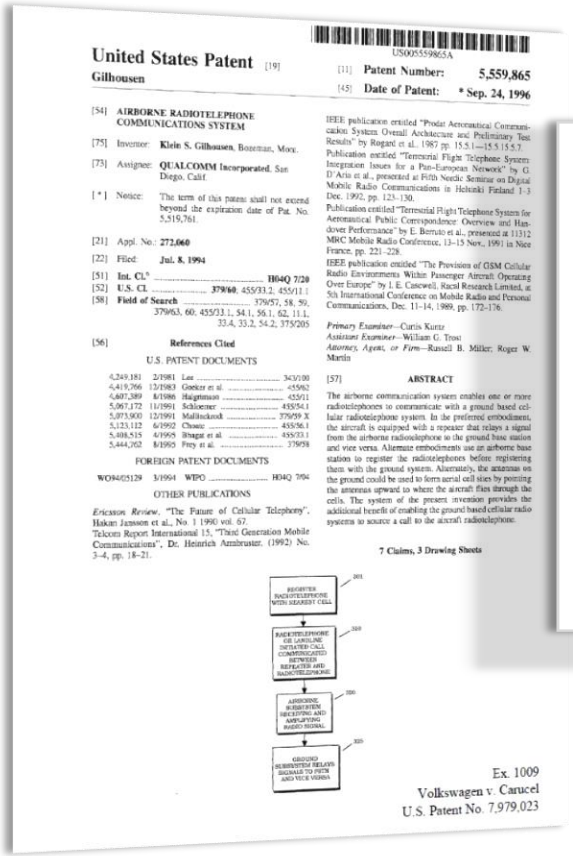
Ex. 1009, Abstract.

1. Field of the Invention

The present invention relates to the field of communications. More particularly, the present invention relates to cellular radiotelephone communications between an airplane and a ground based station.

Ex. 1009, 1:7-10.

Ground 4: Claim 11 – *Gilhousen865* is Unique to Airplanes



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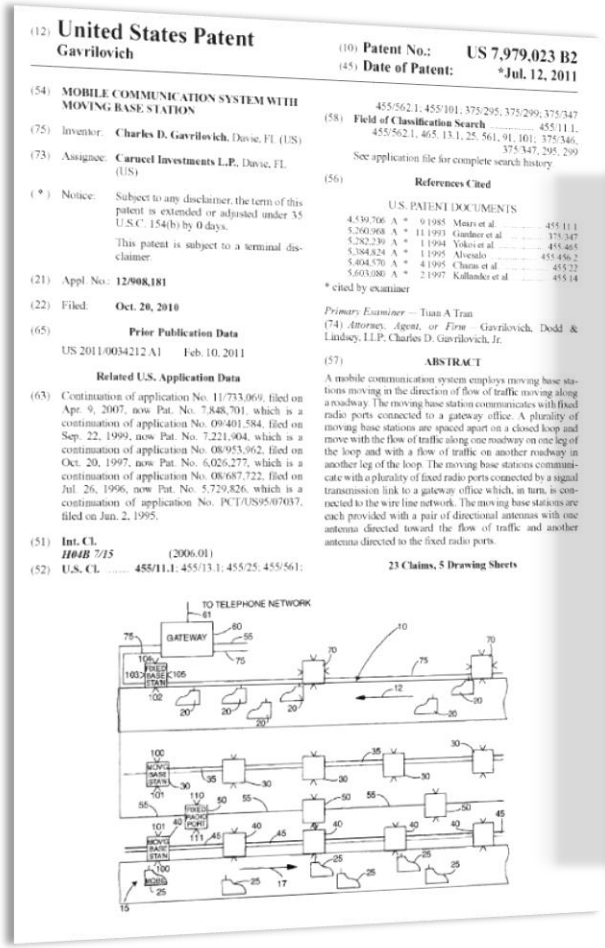
7 Claims, 3 Drawing Sheets

Ex. 1009
Volkswagen v. Carucel
U.S. Patent No. 7,979,023

the aircraft reaches the limit of the cell's coverage. There is a resulting need for an airborne radiotelephone system that is compatible with the ground based cellular radiotelephone system. In other words, an airborne radiotelephone system is needed that enables ground initiated telephone calls to be received by the airborne radiotelephone in addition to the call from the airborne radiotelephone being handed off to the next cell as it reaches the edge of the cell's coverage.

Ex. 1009, 1:41-48.

Ground 4: *Gilhousen865 with Gilhousen390*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706	A *	9/1985	Mears et al.	455/11.1
5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,239	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kullander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Independent Claim 11

11. An apparatus configured to move relative to Earth, the apparatus comprising:

a plurality of spatially separated antennas; and

a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas; and

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

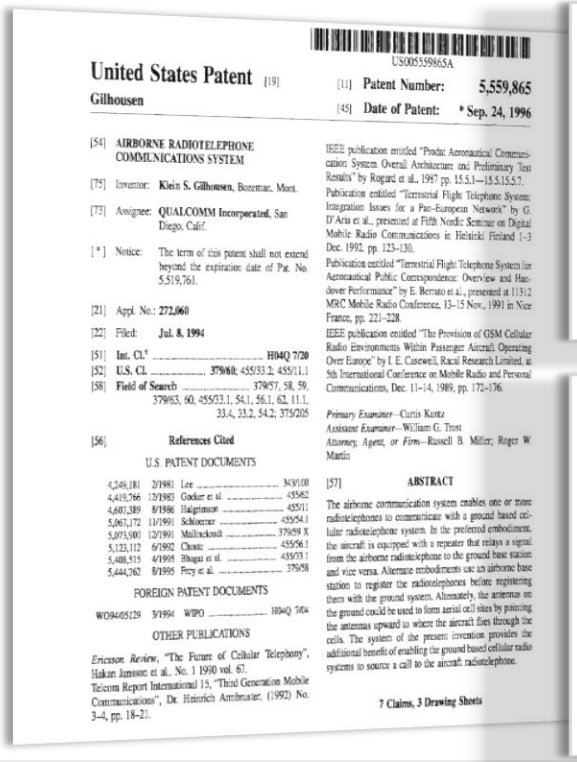
Ex. 1001, Claim 11.

Ground 4: Claim 11 – "A Mobile Device"

- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious "a mobile device" in the context of the entire '023 Patent:
  - *Gilhousen865* does not disclose that its radiotelephone is capable of directly communicating with a fixed cellular base station; and
  - *Gilhousen865* does not disclose that its radiotelephone is capable of registering with a cellular network.

Ground 4: Claim 11 – "A Mobile Device"

- First, *Gilhousen865* discloses That its radiotelephone is only able to communicate with a cellular network through the signal repeater or the alternative base station-type unit:



US005559865A

United States Patent [19]
Gilhousen

[11] **Patent Number: 5,559,865**
[45] **Date of Patent: * Sep. 24, 1996**

[54] **AIRBORNE RADIOTELEPHONE COMMUNICATIONS SYSTEM**

[75] Inventor: **Klein S. Gilhousen**, Bozeman, Mont.

[73] Assignee: **QUALCOMM Incorporated**, San Diego, Calif.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,519,761.

[21] Appl. No.: **272,060**

[22] Filed: **Jul. 8, 1994**

[51] Int. Cl.[6] **H04Q 7/20**
[52] U.S. Cl. **379/60**; 455/33.2; 455/11.1
[58] Field of Search 379/57, 58, 59, 379/63, 60; 455/33.1, 54.1, 56.1, 62, 11.1, 33.4, 33.2, 54.2; 375/205

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,249,181	2/1981	Lee	343/100
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4,607,389	8/1986	Halgrimson	455/11
5,067,172	11/1991	Schloemer	455/54.1
5,073,900	12/1991	Mallinckrodt	379/59 X
5,123,112	6/1992	Choate	455/56.1
5,408,515	4/1995	Bhagat et al.	455/33.1
5,444,762	8/1995	Frey et al.	379/58

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WO94/05129	3/1994	WIPO	H04Q 7/04

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IEEE publication entitled "The Provision of GSM Cellular Radio Environments Within Passenger Aircraft Operating Over Europe" by I. E. Casewell, Racal Research Limited, at 5th International Conference on Mobile Radio and Personal Communications, Dec. 11-14, 1989, pp. 172-176.

Primary Examiner—Curtis Kuntz
Assistant Examiner—William G. Trost
Attorney, Agent, or Firm—Russell B. Miller; Roger W. Martin

[57] **ABSTRACT**

The airborne communication system enables one or more radiotelephones to communicate with a ground based cellular radiotelephone system. In the preferred embodiment, the aircraft is equipped with a repeater that relays a signal from the airborne radiotelephone to the ground base station and vice versa. Alternate embodiments use an airborne base station to register the radiotelephones before registering them with the ground system. Alternately, the antennas on the ground could be used to form aerial cell sites by pointing the antennas upward to where the aircraft flies through the cells. The system of the present invention provides the additional benefit of enabling the ground based cellular radio systems to source a call to the aircraft radiotelephone.

7 Claims, 3 Drawing Sheets

The repeater (**210**) receives the signals from the individual radiotelephones (**205**) within the aircraft and relays them to an antenna (**215**) mounted on the outside of the aircraft. The outside antenna (**215**) relays the signals to the base station on the ground. This subsystem may have a

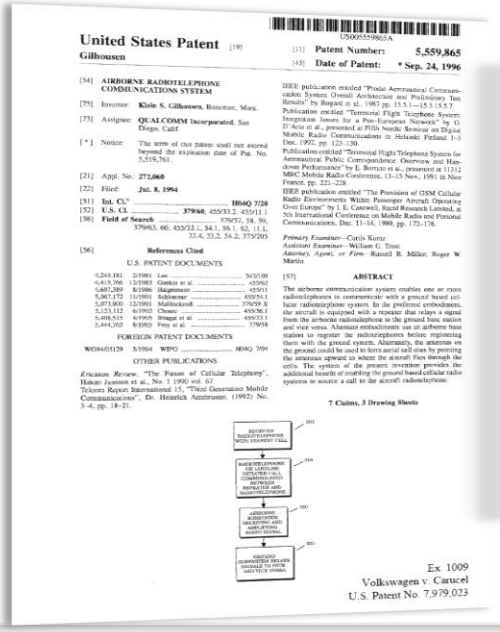
Ex. 1009, 2:53-57.

The airborne subsystem also operates in the reverse direction. 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. The repeater's antenna communicates the signal to the proper radiotelephone (**205**) in the aircraft. The radiotele-

Ex. 1009, 2:60-65.

Ground 4: Claim 11 – "A Mobile Device"

- Second, *Gilhousen865* further discloses that its radiotelephone is not capable of registering with a cellular network.
- Instead, *Gilhousen865's* radiotelephone must rely on either the separate signal repeater or the alternative base station-type unit to perform this registration:



United States Patent [19]
Gilhousen

US005559865A
[11] Patent Number: 5,559,865
[45] Date of Patent: * Sep. 24, 1996

[54] AIRBORNE RADIOTELEPHONE COMMUNICATIONS SYSTEM

[75] Inventor: Klein S. Gilhousen, Boxford, Mass.

[73] Assignee: QUALCOMM Incorporated, San Diego, Calif.

[*] Notice: This term of this patent shall not extend beyond the expiration date of Pat. No. 5,519,761.

[21] Appl. No.: 272,060

[22] Filed: Jul. 8, 1994

[51] Int. Cl.[6] H04Q 7/20

[52] U.S. Cl. 379/60; 455/33.2; 455/11.1

[58] Field of Search 379/57, 58, 59, 60; 455/33.1, 34.1, 56.1, 62, 11.1, 33.4, 33.2, 54.2; 375/205

[56] References Cited

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WO86/05129 9/1986 WIPO H04Q 7/04

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Primary Examiner—Curtis Kuntz
Assistant Examiner—William G. Trost
Attorney, Agent, or Firm—Russell B. Miller; Roger W. Martin

[57] ABSTRACT

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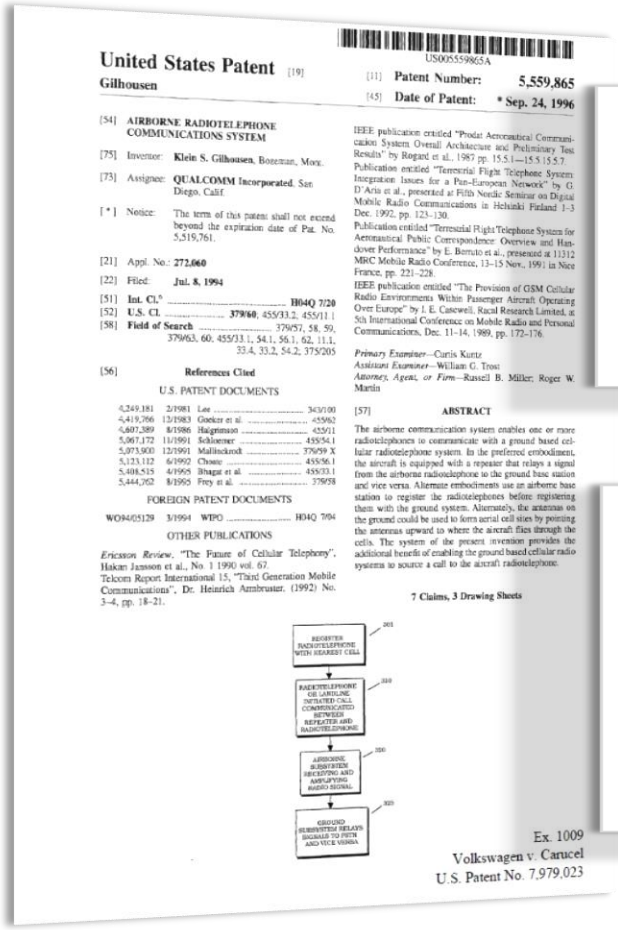
7 Claims, 3 Drawing Sheets

Ex. 1009
Volkswagen v. Carucel
U.S. Patent No. 7,979,023

> The process begins by the airborne repeater registering the radiotelephone with the nearest cell site (**301**). This is accomplished in the same manner as a terrestrial radiotelephone registers with the ground based radiotelephone system; the repeater searches for the strongest pilot signal and registers with that cell.

Ex. 1009, 3:15-19.

Ground 4: Claim 11 – "A Mobile Device"



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7 Claims, 3 Drawing Sheets

Ex. 1009
Volkswagen v. Carucel
U.S. Patent No. 7,979,023

radiotelephone to contact an airborne radiotelephone. Since the repeater has registered the airborne radiotelephone with the proper ground base station, the mobile switching center knows to which base station the call is to be routed. Once the

Ex. 1009, 3:43-46.

In an alternate embodiment, the radiotelephone signal repeater is replaced by an airborne base station that has the ability to register the radiotelephones on the aircraft. The airborne base station then registers the radiotelephone with the ground based subsystem.

Ex. 1009, 3:3-7.

Ground 4: Claim 11 – "A Mobile Device"

Testimony of Carucel's Expert

A I would say as far as the network is concerned, the network is concerned the radiotelephone is registered with the network; however, as I just explained, the Gilhousen reference also explains that the repeater is being a proxy for the radiotelephone. So the radiotelephone itself is not registering with the network. And so -- and why I'm making that

IPR2019-01103, Ex. 1040, 334:12-19.

Ground 4: Claim 11 – "A Mobile Device"

Testimony of Carucel's Expert

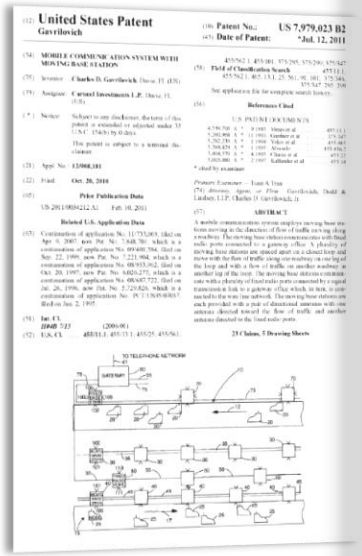
Q Correct. And so the end result is the radiotelephone becoming registered with the ground base station, correct?

A No. The end result is that the airborne repeater registers the radiotelephone on the radiotelephone's behalf with the network and so the airborne repeater is the one registering with the terrestrial radio network.

IPR2019-01103,
Ex. 1040, 333:15-22.

Ground 4: *Gilhousen865 with Gilhousen390*

Dependent Claims 16 - 19


United States Patent
Gavrilovich

Patent No.: US 7,979,023 B2
Date of Patent: *Jul. 12, 2011

MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION

Inventor: Charles D. Gavrilovich, Dover, FL (US)

Assignee: Current Investments, LP, Dover, FL (US)

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

This patent is subject to a terminal disclaimer.

Appl. No.: 12/908,181

Filed: Oct. 20, 2010

Prior Publication Data

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

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Int. Cl.
H04B 7/15 (2006.01)
U.S. Cl. 455/11.1; 455/13.1; 455/25; 455/561

References Cited

U.S. PATENT DOCUMENTS

* cited by examiner

Primary Examiner — Tuan A Tran

ABSTRACT

23 Claims, 5 Drawing Sheets

16. An apparatus in accordance with claim **11**, further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.

17. An apparatus in accordance with claim **11**, further comprising a controller configured to align and combine the received radio frequency signals.

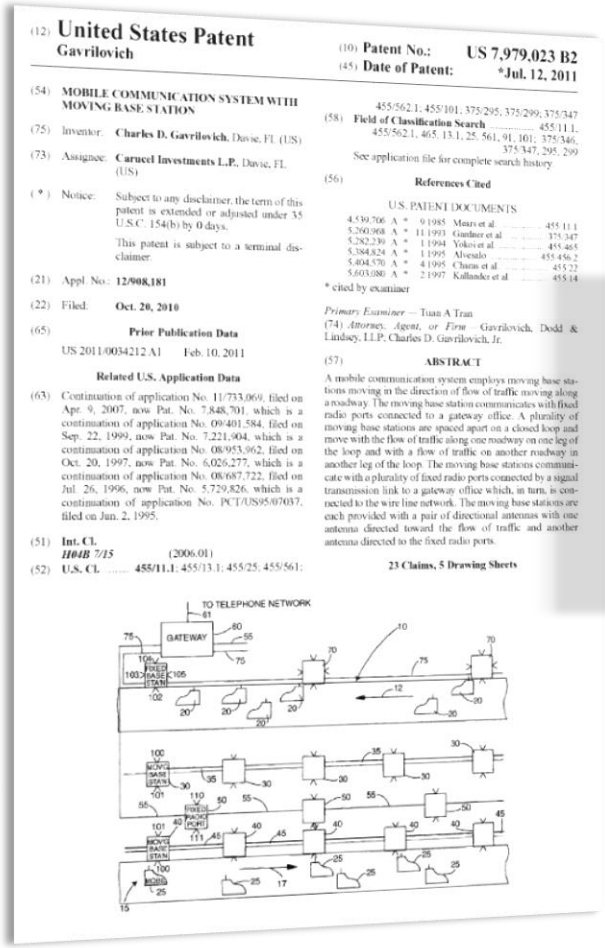
18. An apparatus in accordance with claim **11**, the transmitter further configured to transmit the radio frequency signals within time slots of time-division multiplex channels.

19. An apparatus in accordance with claim **11**, wherein the apparatus is conveyed by a vehicle.

Ex. 1001, Claims 16-19.

- Since the Petition fails to show that *Gilhousen865* in combination with *Gilhousen390* renders obvious all limitations of Claim 11, its challenges to Claims 16-19 fail for the same reasons.

Ground 4: *Gilhousen865 with Gilhousen390*



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(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history

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* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

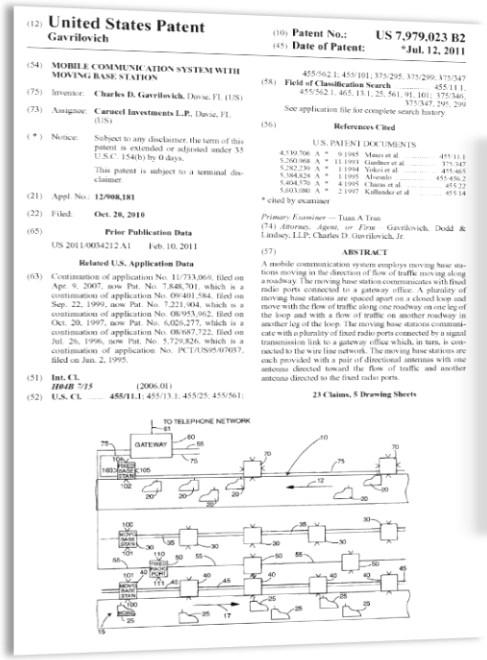
Dependent Claim 20

20. An apparatus in accordance with claim **19**, wherein the vehicle is an automotive vehicle.

Ex. 1001, Claim 20.

Ground 4: Claim 20 – "Automotive Vehicle"

- the '023 Patent provides an example of a vehicle ("by means of rail") while also providing an example of an "automotive vehicle" ("automotive vehicle traveling on the roadway"):



(12) **United States Patent**
Gavrilovich

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H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,530,706	A *	9/1985	Muro et al.	455/11.1
5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,230	A *	1/1994	Yokoi et al.	455/465
5,384,824	A *	1/1995	Alvarado	455/456.2
5,404,570	A *	4/1995	Chacin et al.	455/22
5,603,080	A *	2/1997	Kellenbenz et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

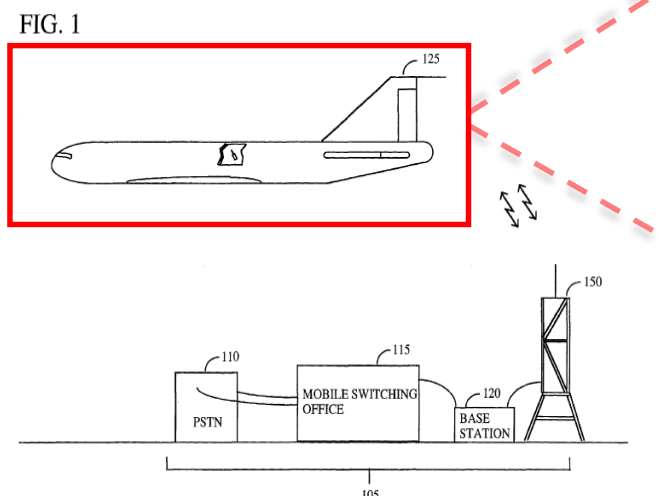
23 Claims, 5 Drawing Sheets

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**, as indicated by the arrow **12**.

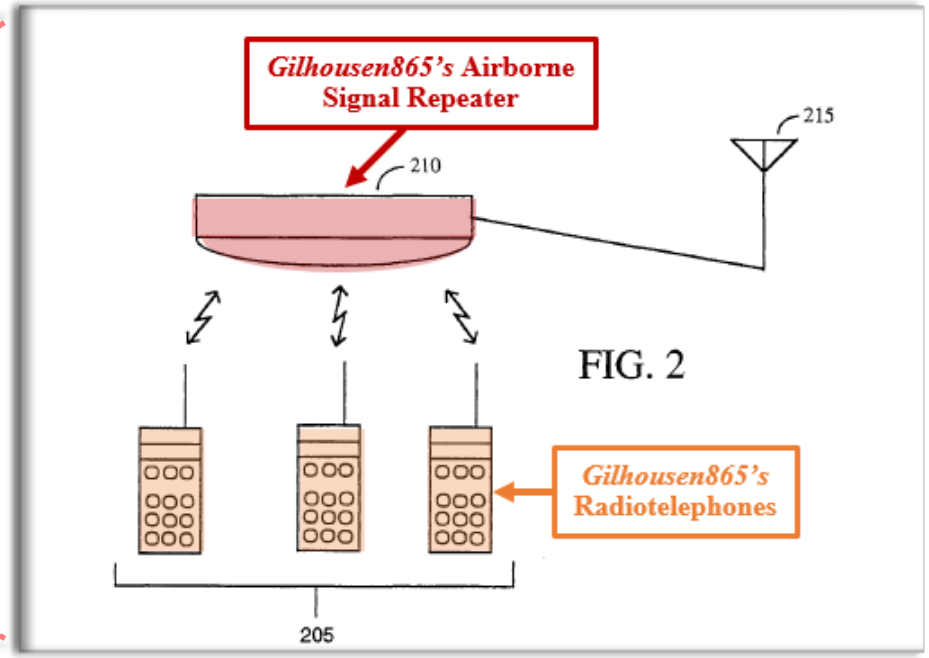
Ex. 1001, 4:6-10.

Ground 4: Claim 20 – "Automotive Vehicle"

- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious an "automotive vehicle."
- Instead, *Gilhousen865* only discloses a signal repeater or the alternative base station-type unit <u>mounted on an airplane</u>:



Ex. 1009, Figure 1.



Ex. 1009, Figure 2.

"Automotive Vehicle" ≠ moves by means of its own power

Wasica Finance GmbH v. Continental Automotive Sys., Inc.

"It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous."

Wasica Finance GmbH v. Continental Automotive Sys., Inc., 853 F.3d 1272, 1288 n.10 (Fed. Cir. 2017).

Wi-LAN USA, Inc. v. Apple Inc.

"The doctrine of claim differentiation provides a presumption that differently worded claims cover different claim scope."

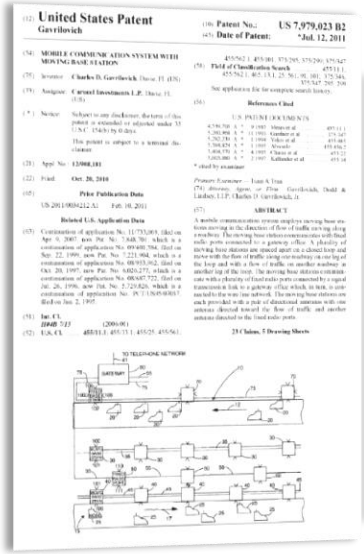
Wi-LAN USA, Inc. v. Apple Inc., 830 F.3d 1374, 1391 (Fed. Cir. 2016).

"Automotive Vehicle" ≠ moves by means of its own power

- Petitioner (VW GoA) proposes that "automotive vehicle" should be interpreted as a vehicle that "moves by means of its own power."
  - There is no distinction between the claim terms "vehicle" (Claim 19) or "automotive vehicle" (Claim 20) when considering the separate and distinct examples set forth in the specification because both examples are "vehicles" and certainly move by "means of [their] own power."
  - Even adding *Gilhousen865's* airplane into Petitioner's analysis further renders the term "automotive vehicle" superfluous for the same reasons.

Ground 4: *Gilhousen865 with Gilhousen390*

Dependent Claims 21 - 22



United States Patent
Gavrilovich

(12) (10) Patent No.: US 7,979,023 B2
(45) Date of Patent: *Jul. 12, 2011

(54) MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION

(75) Inventor: Charles D. Gavrilovich, Dover, FL (US)

(73) Assignee: Corsair Investments L.P., Dover, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: 12/908,181

(22) Filed: Oct. 20, 2010

(65) Prior Publication Data

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,003, filed on Apr. 9, 2007, now Pat. No. 7,848,780, which is a continuation of application No. 09/401,704, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/933,912, filed on Oct. 20, 1997, now Pat. No. 6,026,271, which is a continuation of application No. 08/647,727, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/03851, filed on Jun. 2, 1995.

(51) Int. Cl.
H04B 7/23 (2006.01)
(52) U.S. Cl. 455/11.1; 455/13.1; 455/25; 455/561

(57) ABSTRACT

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base stations communicate with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway on another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

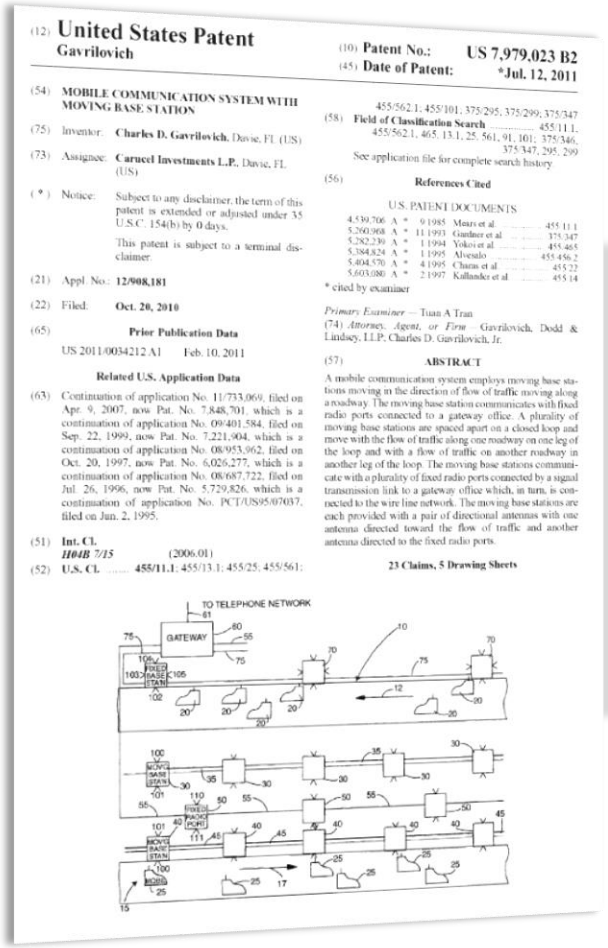
21. An apparatus in accordance with claim **11**, wherein the receiver is further configured to receive fixed port signals from a plurality of fixed ports through the plurality of spatially separated antennas.

22. An apparatus in accordance with claim **21**, wherein each fixed port signal transmitted from each of the plurality of fixed ports includes common data.

Ex. 1001, Claims 21 & 22.

- Since the Petition fails to show that *Gilhousen865* in combination with *Gilhousen390* renders obvious all limitations of Claim 11, its challenges to Claims 21-22 fail for the same reasons.

Ground 5: *Gilhousen865* and *Gilhousen390* with *Fenwick*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

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US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299

See application file for complete search history.

(56) **References Cited**

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5,282,239	A *	1/1994	Yokoi et al.	455/465
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5,603,080	A *	2/1997	Kullander et al.	455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

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A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Dependent Claim 23

23. An apparatus in accordance with claim **22**, wherein transmission of each fixed port signal from each of the plurality of fixed ports is delayed by a different time and the receiver is configured to receive and separate the fixed port signals.

Ex. 1001, Claim 23.

Ground 5: Dependent Claim 23

- Since the Petition fails to show that *Gilhousen865* in combination with *Gilhousen390* renders obvious all limitations of Claim 11, its challenges to Claim 23 fail for the same reasons.
- Claim 23 of the '023 Patent indirectly depends from independent Claim 11 and therefore, incorporates at least the limitation from independent Claim 11 of "a mobile device."
  - As previously demonstrated in Ground 4, *Gilhousen865* and *Gilhousen390* do not disclose or render obvious "a mobile device."
  - *Fenwick* is not used by the Petitioner or Mr. Denning to satisfy the limitation of "a mobile device."
  - Instead, Petitioner merely alleges that *Fenwick* describes a time diversity configuration in which the signals are repeatedly transmitted with a time delay between each transmission.

Mr. Lanning's Testimony Does Not Lack Evidentiary Support

- Petitioner's distortion of one specific instance from Mr. Lanning's deposition testimony regarding one opinion within his expert declaration—to improperly allege that Mr. Lanning's entire declaration (Ex. 2100) employs merely a "take-it-or-leave-it approach" and "often lacks any evidentiary support"—is improper.

Volkswagen Group of America, Inc.

Petitioner

v.

Carucel Investments, L.P.

Patent Owner

Case No. IPR2019-01102

U.S. Patent No. 7,848,701

VW GoA's Patentability Challenges of the '701 Patent

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

- Same primary references as IPR2019-01103—*Ito* and *Gilhousen865*.
- Same secondary references as IPR2019-01103—*Gardner* and *Gilhousen390*.

Primary Reasons Carucel Should Prevail

- No motivation to combine Petitioner's prior art references
  - Petitioner's proposed combinations either result in inoperable devices or suffer from critical capability issues.
- Ground 1:
  - *Ito* Does Not Disclose "A Mobile Device" Required by Claims 10, 15, 17, and 18.
  - Neither *Ito* Nor *Gardner* disclose "a controller configured . . . to select a best signal" required by Claim 15.

Primary Reasons Carucel Should Prevail

- Grounds 2:
  - *Gilhousen865* fails to disclose "configured to" required by Claims 10, 15, 17, and 18.
  - *Gilhousen865* Fails to Disclose "A Mobile Device" Required by Claims 10, 15, 17, and 18.
  - *Gilhousen865* Fails to Disclose "automotive vehicle" Required by Claim 18.

No Motivation to Combine the Prior Art References

Grounds 1 – 3: *Ito* with *Gardner*

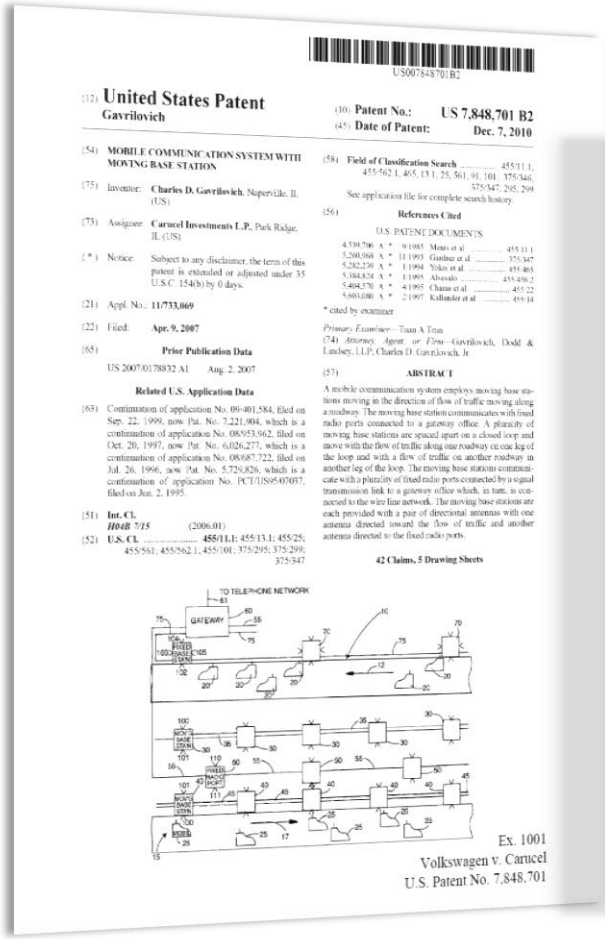
- For the same reasons set forth in IPR2019-01103 ('023 Patent), a POSITA would not have been motivated to combine *Ito* with *Gardner*:
  - Such a combination would result in an inoperable device.
  - Such a combination would also require much new circuitry not disclosed in either *Ito* or *Gardner*.

No Motivation to Combine the Asserted Prior Art References

Grounds 4-5: *Gilhousen865* with *Gilhousen390*

- For the same reasons set forth in IPR2019-01103 ('023 Patent), a POSITA would not have been motivated to combine *Gilhousen865* with *Gilhousen390*:
  - *Gilhousen390's* CDMA signal diversity configurations will not work if employed on *Gilhousen865's* high speed airborne repeater.
  - As a result, the combination would suffer from the same issues that the *Gilhousen865* invention was attempting to overcome.

Ground 1: *Ito* with *Gardner*



US007848701B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,848,701 B2**
(45) **Date of Patent: Dec. 7, 2010**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **11/733,069**

(22) Filed: **Apr. 9, 2007**

(65) **Prior Publication Data**

US 2007/0178832 A1 Aug. 2, 2007

Related U.S. Application Data

(63) Continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07057, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 455.13.1, 25, 561, 91, 101, 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

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5,282,239	A *	1/1994	Yokev et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Chanu et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner—Tuan A Tran
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

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42 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,848,701

Independent Claim 10

10. A movable base station configured to move relative to Earth, the movable base station comprising:

a plurality of spatially separated antennas;

a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas;

a controller configured to align and combine the received fixed port signals; and

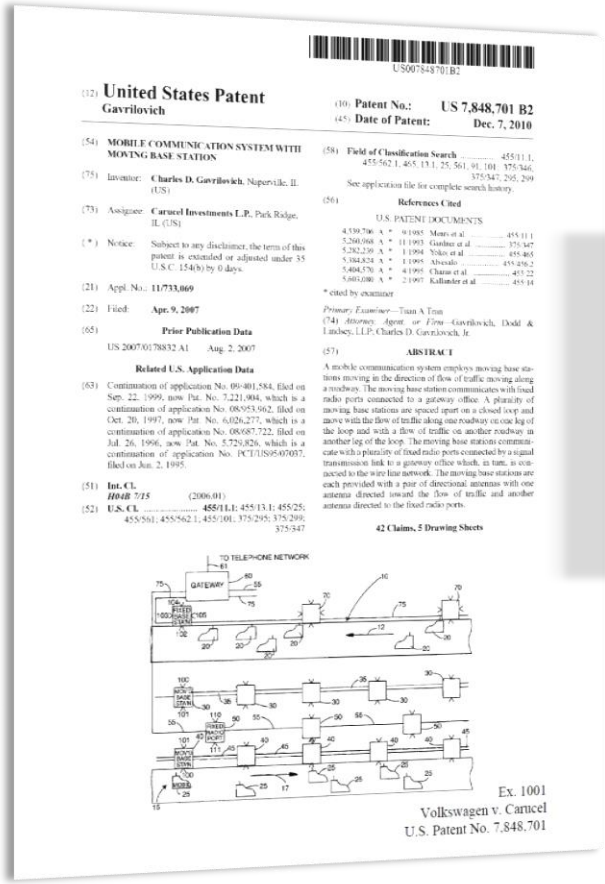
a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.

Ex. 1001, Claim 10.

Ground 1: Claim 10 – "A Mobile Device"

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Ito* and *Gardner* do not disclose or render obvious "a mobile device" in the context of the entire '701 Patent:
  - *Ito* does not disclose that its portable device (PSS) can directly communicate with a cellular network.
  - *Ito* does not disclose that its portable device can register with a cellular network.
  - *Ito* discloses That its portable device (PSS) is only able to communicate with a cellular network through *Ito's* mobile base device (MSS).

Ground 1: *Ito with Gardner*



US007848701B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,848,701 B2**
(45) **Date of Patent: Dec. 7, 2010**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **11/733,069**

(22) Filed: **Apr. 9, 2007**

(65) **Prior Publication Data**

US 2007/0178832 A1 Aug. 2, 2007

Related U.S. Application Data

(63) Continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,502, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

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5,282,239	A *	1/1994	Yokev et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner—Tuan A Tran
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(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

42 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,848,701

Dependent Claim 15

15. A movable base station in accordance with claim **10**, further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.

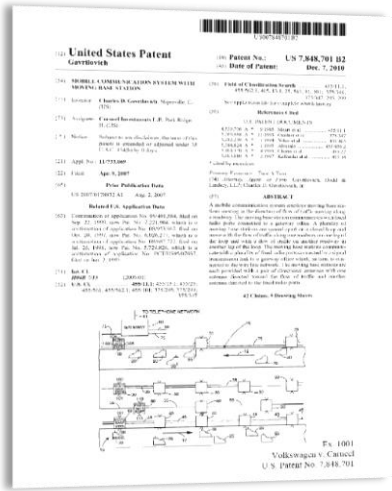
Ex. 1001, Claim 15.

Ground 1: Claim 15 – *"To Select a best signal"*

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Ito* and *Gardner* do not disclose or render obvious "select[ing] a best signal" in the context of the entire '701 Patent:
  - the '701 Patent requires "best signal" to include an analysis of the signal quality (i.e., error rate) AND signal strength.
  - *Gardner* does not disclose "select[ing] a best signal."
  - Instead, *Gardner* only discloses the method of "selection diversity" which "cho[oses] the antenna that provides the strongest signal".
  - Strongest signal ≠ "Best Signal".

Ground 1: *Ito* with *Gardner*

Dependent Claim 17



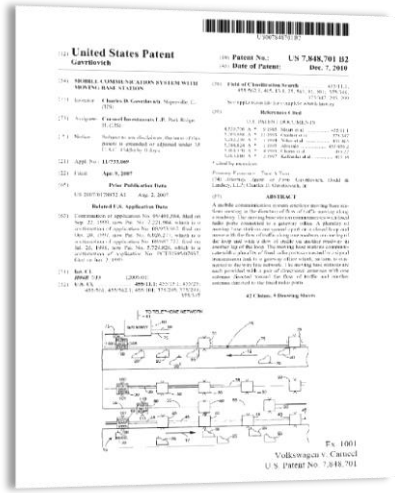
17. A movable base station in accordance with claim **10**, wherein the movable base station is conveyed by a vehicle.

Ex. 1001, Claim 17.

- Since the Petition fails to show that *Ito* in combination with *Gardner* renders obvious all limitations of Claim 10 of Ground 1, its challenge to Claim 17 fails for the same reasons.

Ground 1: *Ito* with *Gardner*

Dependent Claim 18

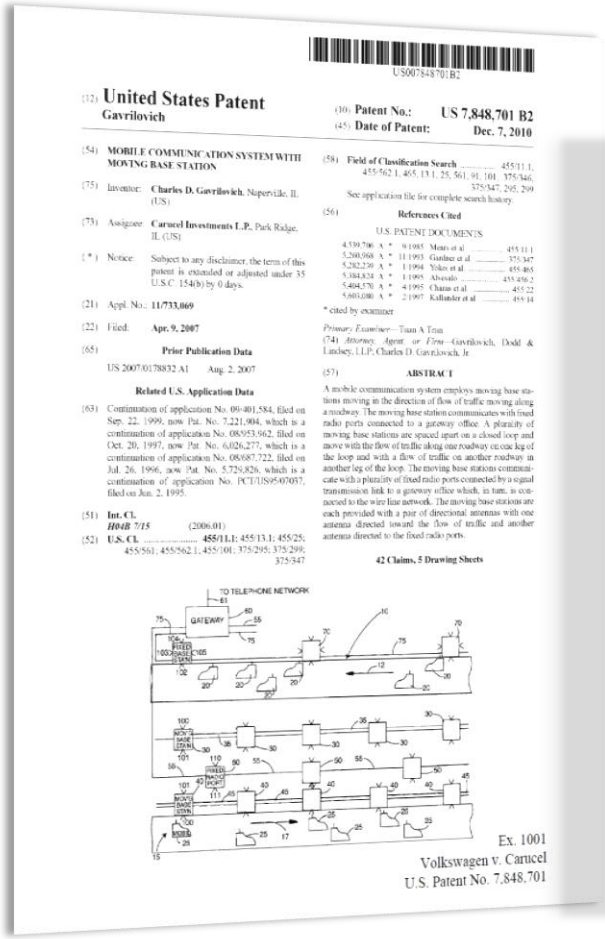


18. A movable base station in accordance with claim **17**, wherein the vehicle is an automotive vehicle.

Ex. 1001, Claim 18.

- Since the Petition fails to show that *Ito* in combination with *Gardner* renders obvious all limitations of Claim 10 of Ground 1, its challenge to Claim 18 fails for the same reasons.

Ground 2: *Gilhousen865* with *Gilhousen390*



US007848701B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,848,701 B2**
(45) **Date of Patent: Dec. 7, 2010**

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(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

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U.S. PATENT DOCUMENTS

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5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,239	A *	1/1994	Yokev et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Chiara et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner—Tuan A Tran
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base stations communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

42 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,848,701

Independent Claim 10

10. A movable base station configured to move relative to Earth, the movable base station comprising:

a plurality of spatially separated antennas;

a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas;

a controller configured to align and combine the received fixed port signals; and

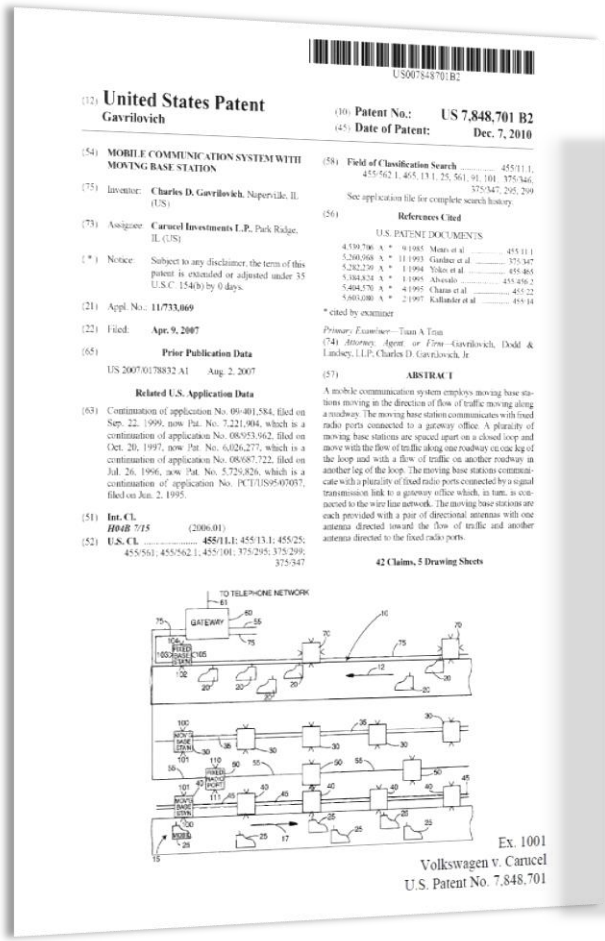
a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.

Ex. 1001, Claim 10.

Ground 2: Claim 10 – "Configured To"

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Gilhousen865* and *Gilhousen390* do not disclose or render obvious "an apparatus configured to move relative to Earth" in the context of the entire '701 Patent:
  - Traffic or rate of speed of traffic is referring to "an automotive vehicle traveling on a roadway," not "airplane traffic".
  - *Gilhousen865* only discloses repeater that is installed on an airplane.
  - An airplane does not move with traffic as it is not bound to predetermined roads.
  - an airplane can travel at speeds up to five hundred miles-per-hour and, as such, does not move with the traffic at a rate of speed which is comparable to the traffic.

Ground 2: *Gilhousen865* with *Gilhousen390*



US007848701B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,848,701 B2**
(45) **Date of Patent: Dec. 7, 2010**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **11/733,069**

(22) Filed: **Apr. 9, 2007**

(65) **Prior Publication Data**

US 2007/0178832 A1 Aug. 2, 2007

Related U.S. Application Data

(63) Continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07057, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 455.13.1, 25, 561, 91, 101, 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706	A *	9/1985	Mears et al.	455/11.1
5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,239	A *	1/1994	Yokev et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Chanu et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

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Primary Examiner—Tuan A Tran
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base stations communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

42 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,848,701

Independent Claim 10

10. A movable base station configured to move relative to Earth, the movable base station comprising:

a plurality of spatially separated antennas;

a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas;

a controller configured to align and combine the received fixed port signals; and

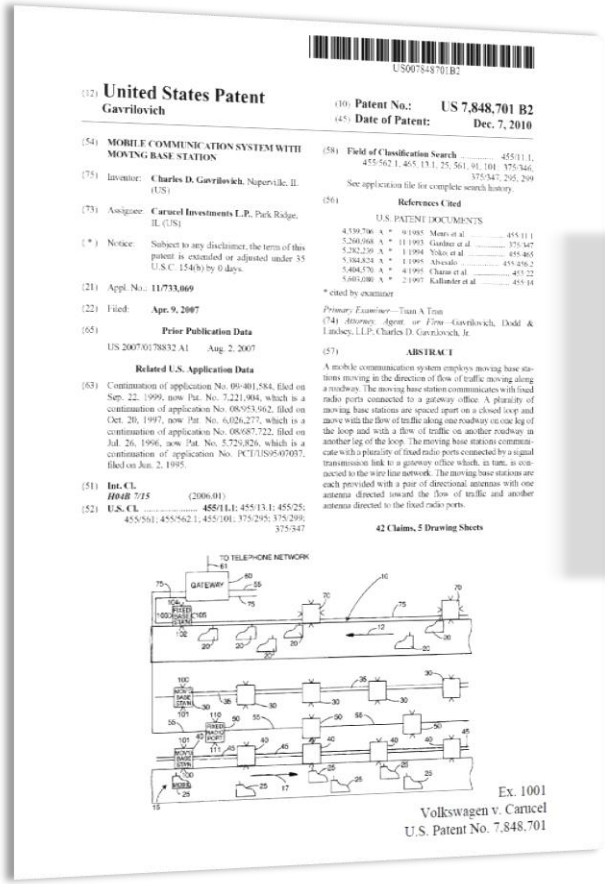
a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.

Ex. 1001, Claim 10.

Ground 2: Claims 10 – "A Mobile Device"

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Gilhousen865* and *Gilhousen390* do not disclose or render obvious "a mobile device" in the context of the entire '701 Patent:
  - *Gilhousen865* discloses that its radiotelephone is only able to communicate with a cellular network through the signal repeater or the alternative base station-type unit.
  - *Gilhousen865* discloses that its radiotelephone is not capable of registering with a cellular network by itself. Instead, *Gilhousen865*'s radiotelephone must rely on either the separate signal repeater or the alternative base station-type unit to perform this registration.

Ground 2: *Gilhousen865* with *Gilhousen390*



US007848701B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,848,701 B2**
(45) **Date of Patent: Dec. 7, 2010**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **11/733,069**

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706	A *	9/1985	Mono et al.	455/11.1
5,260,968	A *	11/1993	Gardner et al.	375/347
5,282,239	A *	1/1994	Yokev et al.	455/465
5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner—Tuan A Tran
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway or one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

42 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,848,701

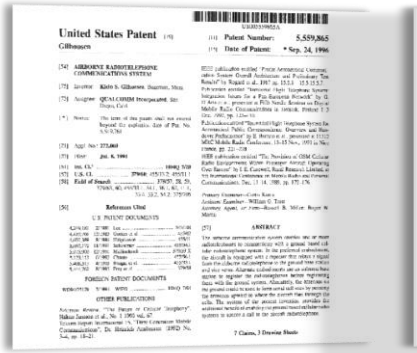
Dependent Claim 15

15. A movable base station in accordance with claim **10**, further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.

Ex. 1001, Claim 15.

Ground 2: Claim 15 – "To Select a Best Signal"

- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious a "controller Configured to . . . Select a best signal"
- Instead, *Gilhousen865* only discloses the method of "search[ing] for the strongest pilot signal from a ground base station and register[ing] with that base station":


United States Patent [19]
Gilhousen

[11] Patent Number: 5,559,865
[45] Date of Patent: * Sep. 24, 1996

[54] AIRBORNE RADIOTELEPHONE COMMUNICATIONS SYSTEM

[57] ABSTRACT

borne base station is illustrated in FIG. 4. Once the radio-telephone is registered with the aircraft base station, the aircraft base station then searches for the strongest pilot signal from a ground base station and registers with that base station.

Ex. 1005, 4:1-5.

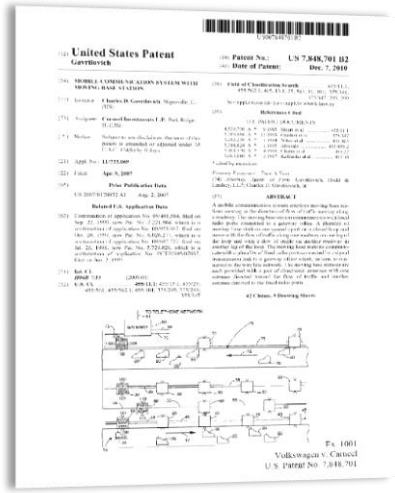
- the '701 Patent requires "best signal" to include an analysis of the signal quality (i.e., error rate) and signal strength.
- the strongest pilot signal ≠ "best fixed radio port(s)"

Ground 2: Claim 15 – *"To Select a best signal"*

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Gilhousen865* and *Gilhousen390* do not disclose or render obvious "select[ing] a best signal" in the context of the entire '701 Patent:
  - the '701 Patent requires "best signal" to include an analysis of the signal quality (i.e., error rate) AND signal strength.
  - *Gardner* does not disclose "select[ing] a best signal."
  - Instead, *Gardner* only discloses the method of "selection diversity" which "cho[oses] the antenna that provides the strongest signal".
  - Strongest signal ≠ "Best Signal".

Ground 2: *Gilhousen865 with Gilhousen390*

Dependent Claim 17

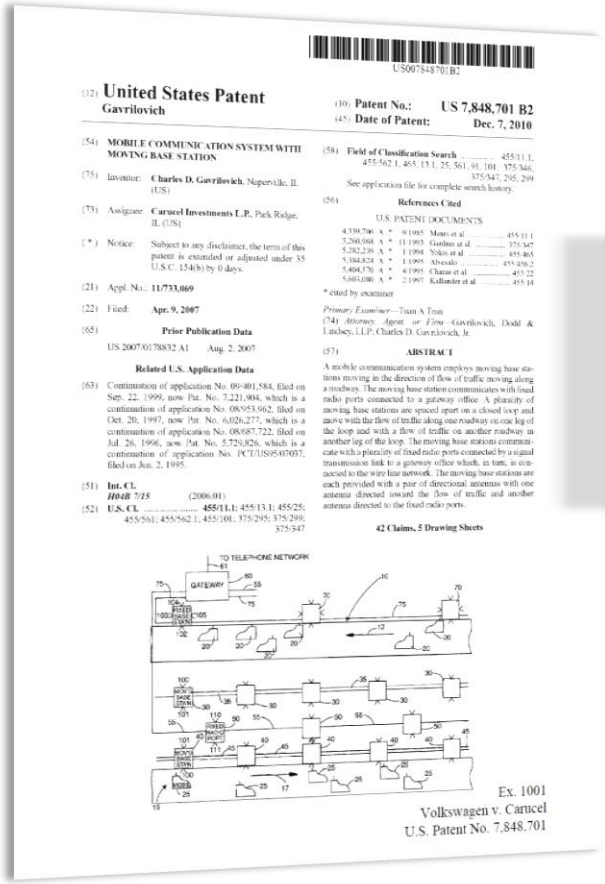


17. A movable base station in accordance with **claim 10**, wherein the movable base station is conveyed by a vehicle.

Ex. 1001, Claim 17.

- Since the Petition fails to show that *Gilhousen865* in combination with *Gilhousen390* renders obvious all limitations of Claim 10 of Ground 2, its challenge to Claim 17 fails for the same reasons.

Ground 2: *Gilhousen865 with Gilhousen390*



US007848701B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,848,701 B2**
(45) **Date of Patent: Dec. 7, 2010**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **11/733,869**

(22) Filed: **Apr. 9, 2007**

(65) **Prior Publication Data**

US 2007/0178832 A1 Aug. 2, 2007

Related U.S. Application Data

(63) Continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history.

(56) **References Cited**

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5,384,824	A *	1/1995	Alvesalo	455/456.2
5,404,570	A *	4/1995	Charas et al.	455/22
5,603,080	A *	2/1997	Kallander et al.	455/14

* cited by examiner

Primary Examiner—Tuan A Tran
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(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

42 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,848,701

Dependent Claim 18

18. A movable base station in accordance with claim **17**, wherein the vehicle is an automotive vehicle.

Ex. 1001, Claim 18.

Ground 2: Claim 18 – "Automotive Vehicle"

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Gilhousen865* and *Gilhousen390* do not disclose or render obvious an "automotive vehicle" in the context of the entire '701 Patent:
  - *Gilhousen865* only discloses a signal repeater or the alternative base station-type unit mounted on an airplane.
  - Petitioner's proposed construction—"a vehicle moving by means of its own power"—would render the term "automotive vehicle" of Claim 18 void, meaningless, and superfluous.

Mr. Lanning's Testimony Does Not Lack Evidentiary Support

- Petitioner's distortion of one specific instance from Mr. Lanning's deposition testimony regarding one opinion within his expert declaration—to improperly allege that Mr. Lanning's entire declaration (Ex. 2100) employs merely a "take-it-or-leave-it approach" and "often lacks any evidentiary support"—is improper.

Volkswagen Group of America, Inc.

Petitioner

v.

Carucel Investments, L.P.

Patent Owner

Case Nos. IPR2019-01101/IPR2019-01573

U.S. Patent No. 7,221,904

VW GoA's Patentability Challenges of the '904 Patent

	Ground	References	Basis	Claims Challenged
1101-Petition	1	Gilhousen865 and Gilhousen390	§ 103	22, 23, 28-35, 40, 50, and 51
	2	Vercauteren and Forssén	§ 103	22, 23, 28, 29, 32-35, 40, 50, and 51
	3	Vercauteren, Forssén, and Gilhousen390	§ 103	30 and 31
1573-Petition	4	Gilhousen865	§ 103	56
	5	Gilhousen865 and Gilhousen390	§ 103	57-59
	6	Vercauteren	§ 103	56
	7	Vercauteren and Gilhousen390	§ 103	57-58
	8	Vercauteren, Gilhousen390, and Forssén	§ 103	59

Petitioner's First Primary Reference – *Gilhousen865*

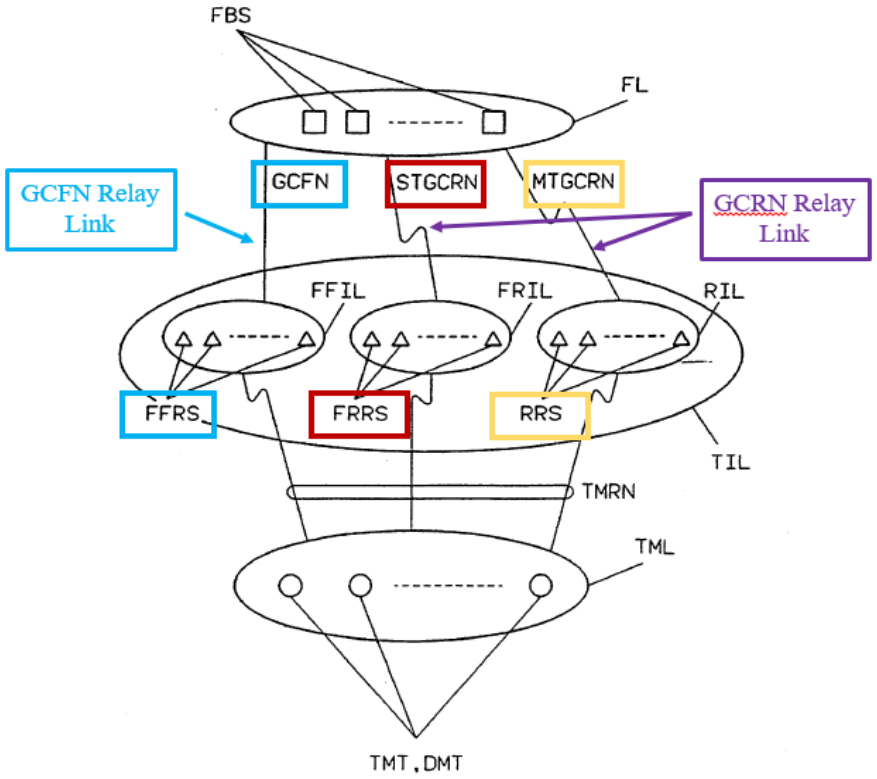
- Petitioner's first primary reference, *Gilhousen865*, is the same primary references as IPR2019-01102 ('701 Patent) and IPR2019-01103 ('023 Patent).

Petitioner's Second Primary Reference – *Vercauteren*

- *Vercauteren* is directed towards providing an alternative, non-standard wireless network to overcome the identified shortcomings of the known, standard cellular network.
  - *Vercauteren* utilizes non-standard base stations (e.g., relay stations); non-standard mobile terminals (e.g., "multi-mode" terminals); and a non-standard connections (e.g., "static" and "mobile" relay links).
- Vercauteren's alternative, non-standard wireless network is comprised of two types of relay links: (i) fixed links known as the global coverage fixed network (GCFN); and (ii) radio links known as the global coverage radio network (GCRN).

Petitioner's Second Primary Reference – *Vercauteren*

- *Vercauteren's* first type of relay link—the global coverage fixed network (**GCFN**)—corresponds to Fixed Relay Stations (**FFRS**) that communicate with the Fixed Level (FL) via the global coverage fixed network (**GCFN**).
- *Vercauteren's* second type of relay link—the global coverage radio network (**GCRN**)—corresponds to two separate and distinct types of relay stations: (i) Fixed Relay Stations (**FRRS**); and (ii) Roaming Relay Stations (**RRS**).
- The Fixed Relay Stations (**FRRS**) communicate with the Fixed Level (FL) via "static radio links" (**STGCRN**); while the Roaming Relay Station (RRS) communicates with the Fixed Level (FL) via "mobile radio links" (**MTGCRN**).



Ex. 1007, Figure 5.

Petitioner's Second Primary Reference – *Vercauteren*

- The only moving apparatus in *Vercauteren* that is capable of communicating with the Mobile Terminal is the Roaming Relay Station (RRS).

- *Vercauteren's* relay stations are purposely limited to "minimum intelligence" and do not contain any type of base station functionality due to complexity and economic reasons. As a result:

  - *Vercauteren* relies on its Fixed Base Stations (FBS) for complex control functions—performing the hand-over decision.

  - *Vercauteren* relies on its Mobile Terminals (TMT, DMT) to collect and organize measurement data in order for the Fixed Base Station (FBS) to make the appropriate hand-over decisions in the mobile communication network.

Primary Reasons Carucel Should Prevail

- No motivation to combine Petitioner's prior art references
  - *Grounds 1 and 5*
    - The combination would result in an inoperable device.
    - As a result, the combination would suffer from the same issues that the *Gilhousen865* invention was attempting to overcome.
  - *Ground 2*
    - The combination would be contrary to the stated objective for *Vercauteren's* relay stations.
    - As a result, the combination would suffer from the same issues that *Vercauteren* was attempting to overcome.
    - The combination would result in an inoperable device.

Primary Reasons Carucel Should Prevail

- *Grounds 3, 7, and 8*
  - The primary reference, *Vercauteren,* explicitly teaches away from utilizing a standard cellular network such as the secondary reference.
  - The combination would be contrary to the stated objective for *Vercauteren's* relay stations.
  - As a result, the combination would suffer from the same issues that *Vercauteren* was attempting to overcome.
  - The combination would result in an inoperable device.

Primary Reasons Carucel Should Prevail

- Ground 1:
  - For the same reasons set forth in IPR2019-01103 ('023 Patent):
    - *Gilhousen865* and *Gilhousen390* do Not Disclose "a Mobile unit" Required by Claims 22, 34, and 50; and
    - *Gilhousen865* Does Not Disclose "adapted to" Required by Claim 22.
  - Neither *Gilhousen865* nor *Gilhousen390* disclose "a transmitter adapted to transmit, within the frequency band a resultant signal to the mobile unit" required by Claim 22.
  - Neither *Gilhousen865* nor *Gilhousen390* disclose "determin[ing] a best fixed radio port" required by Claims 28 and 30.

Primary Reasons Carucel Should Prevail

- Neither *Gilhousen865* nor *Gilhousen390* disclose "a second radio interface adapted to communicate with the plurality of mobile units in the frequency bandwidth" required by Claim 34.

- Neither *Gilhousen865* nor *Gilhousen390* disclose "a processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports" required by Claim 34.

- Ground 2

  - *Vercauteren* and *Forssen* Do Not Disclose "a Mobile unit" Required by Claims 22, 34, and 50.

Primary Reasons Carucel Should Prevail

- Neither *Vercauteren* nor *Forssen* discloses "a receiver adapted to receive a plurality of signals . . . transmitted from [a] plurality of fixed radio ports" Required by Claim 22.
- Neither *Vercauteren* nor *Forssen* discloses "a processor . . . evaluating a quality of each of the plurality of signals transmitted from the plurality of fixed radio ports" required by Claim 22.
- *Vercauteren* and *Forssen* do Not Disclose "determin[ing] a best fixed radio port" required by Claim 28.
- Neither *Vercauteren* nor *Forssen* discloses "a processor adapted to establish a communication link" required by Claim 34.

Primary Reasons Carucel Should Prevail

- *Vercauteren* and *Forssen* Do Not Disclose "wherein the processor is further adapted to establish a second communication link between the plurality of mobile units and at least a second fixed radio port of the plurality of fixed radio ports based on the plurality of signal quality indicators" required by Claim 40.

- Ground 3

  - *Vercauteren*, *Forssen*, and *Gilhousen390* fail to disclose ""processor . . . adapted to determine a plurality of best fixed radio ports" required by Claim 30.

  - *Vercauteren*, *Forssen*, and *Gilhousen390* fail to disclose "determin[ing] a plurality of best fixed radio ports" required by Claim 31.

Primary Reasons Carucel Should Prevail

- Ground 4:
  - *Gilhousen865* does Not Disclose "a Mobile unit" Required by 56.
  - *Gilhousen865* does not disclose "simultaneously handing off the plurality of mobile units to a second fixed port" required by Claim 56.
- Ground 5
  - Neither *Gilhousen865* nor *Gilhousen390* disclose the additional limitations of independent Claim 56 required by dependent Claims 57-59.

Primary Reasons Carucel Should Prevail

- Ground 6:
  - *Vercauteren* Does Not Disclose "a Mobile unit" Required by 56.
  - *Vercauteren* does not disclose "simultaneously handing off the plurality of mobile units to a second fixed port" required by Claim 56.
- Ground 7
  - Neither *Vercauteren* nor *Gilhousen390* disclose the additional limitations of independent Claim 56 required by dependent Claims 57-58.
- Ground 8
  - *Vercauteren*, *Gilhousen390*, and *Forssen* fail to disclose the additional limitations of independent Claim 56 required by dependent Claim 59.

Primary Reasons Carucel Should Prevail

- Ground 8
  - *Vercauteren*, *Gilhousen390*, and *Forssen* fail to disclose the additional limitations of independent Claim 56 required by dependent Claim 59.

No Motivation to Combine the Prior Art References

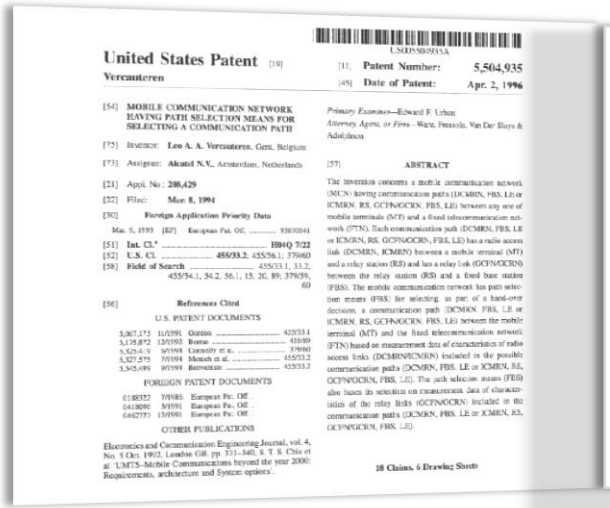
Grounds 1 & 5 : *Gilhousen865 and Gilhousen390*

- For the same reasons set forth in IPR2019-01103 ('023 Patent), a POSITA would not have been motivated to combine *Gilhousen865* with *Gilhousen390*:
  - *Gilhousen390's* CDMA signal diversity configurations will not work if employed on *Gilhousen865's* high speed airborne repeater.
  - As a result, the combination would suffer from the same issues that the *Gilhousen865* invention was attempting to overcome.

No Motivation to Combine the Prior Art References

Ground 2: *Vercauteren and Forssen*

- First, a POSITA would not have been motivated to modify *Vercauteren* with *Forssen* because such a combination would be contrary to the stated objective for *Vercauteren's* relay stations.
  - *Vercauteren* discloses that its Relay Stations are purposely limited in functionality due to complexity and economic reasons:



United States Patent [19]
Vercauteren

[11] Patent Number: 5,504,935
[45] Date of Patent: Apr. 2, 1996

[54] MOBILE COMMUNICATION NETWORK HAVING PATH SELECTION MEANS FOR SELECTING A COMMUNICATION PATH

[75] Inventor: Leo A. A. Vercauteren, Gent, Belgium

[73] Assignee: Alcatel N.V., Amsterdam, Netherlands

[21] Appl. No.: 208,429

[22] Filed: Mar. 8, 1994

[30] Foreign Application Priority Data

[51] Int. Cl.[6] H04Q 7/22
[52] U.S. Cl. 455/33.2; 455/56.1; 379/60
[58] Field of Search 455/33.1, 33.2, 455/54.1, 54.2, 56.1, 15, 20, 89; 379/59, 60

[56] References Cited

U.S. PATENT DOCUMENTS

FOREIGN PATENT DOCUMENTS

OTHER PUBLICATIONS

Primary Examiner—Edward F. Urban
Attorney, Agent, or Firm—Ware, Fressola, Van Der Sluys & Adolphson

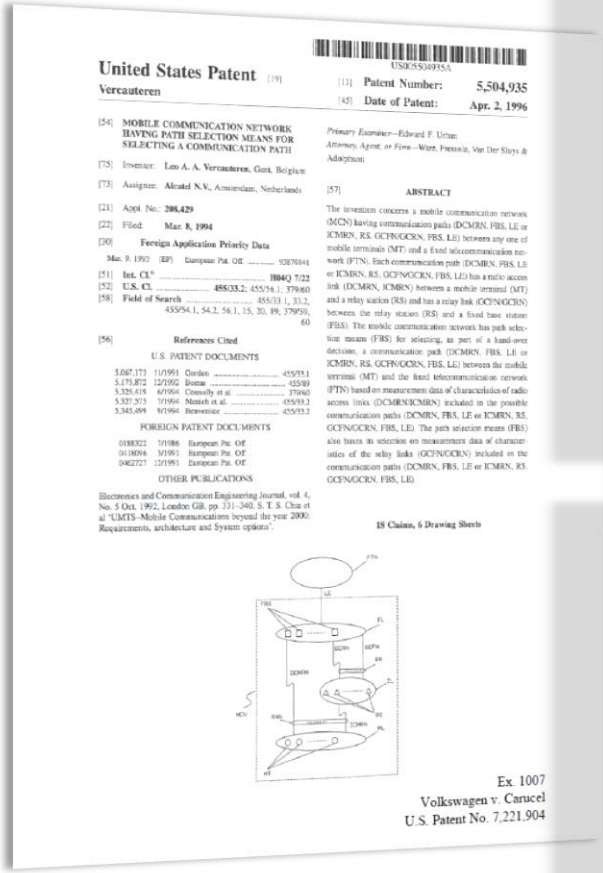
[57] ABSTRACT

18 Claims, 6 Drawing Sheets

sions, and the routing to the fixed network. In the second structure such a solution would lead to a commercial drawback since providing such a complex base station in each micro-cell would require huge investments. Therefore, in the micro-cells, use is made of relay stations, called base transceiver stations, which have a minimum intelligence in the micro-cells and the traffic of a number of which, for instance corresponding to a macro-cell, is concentrated in a base station.

Ex. 1007, 1:46-54.

No Motivation to Combine
Ground 2: *Vercauteren* and *Forssen*



United States Patent [19]
Vercauteren

US005504935A
[11] Patent Number: 5,504,935
[45] Date of Patent: Apr. 2, 1996

[54] MOBILE COMMUNICATION NETWORK HAVING PATH SELECTION MEANS FOR SELECTING A COMMUNICATION PATH

[75] Inventor: Leo A. A. Vercauteren, Gent, Belgium

[73] Assignee: Alcatel N.V., Amsterdam, Netherlands

[21] Appl. No.: 208,429

[22] Filed: Mar. 8, 1994

[30] Foreign Application Priority Data

Mar. 9, 1993 [EP] European Pat. Off. 93870044

[51] Int. Cl.[6] H04Q 7/22

[52] U.S. Cl. 455/33.2; 455/54.1; 379/60

[58] Field of Search 455/33.1, 33.2, 455/54.1, 54.2, 56.1, 15, 20, 89, 379/59, 60

[56] References Cited

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0462727	12/1991	European Pat. Off.

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Electronics and Communication Engineering Journal, vol. 4, No. 5 Oct. 1992, London GB, pp. 331-340, S. T. S. Chia et al "UMTS-Mobile Communications beyond the year 2000: Requirements, architecture and System options".

Primary Examiner—Edward F. Urban
Attorney, Agent, or Firm—Ware, Fressola, Van Der Sluys & Adolphson

[57] ABSTRACT

The invention concerns a mobile communication network (MCN) having communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) between any one of mobile terminals (MT) and a fixed telecommunication network (FTN). Each communication path (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) has a radio access link (DCMRN, ICMRN) between a mobile terminal (MT) and a relay station (RS) and has a relay link (GCFN/GCRN) between the relay station (RS) and a fixed base station (FBS). The mobile communication network has path selection means (FBS) for selecting, as part of a hand-over decision, a communication path (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) between the mobile terminal (MT) and the fixed telecommunication network (FTN) based on measurement data of characteristics of radio access links (DCMRN/ICMRN) included in the possible communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE). The path selection means (FBS) also bases its selection on measurement data of characteristics of the relay links (GCFN/GCRN) included in the communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE).

18 Claims, 6 Drawing Sheets

Ex. 1007
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

It is clear that when such relay links MTGCRN are used, some relay link measurements have to be used for the hand-over decision because the roaming relay station RRS behaves towards the fixed level FL as a mobile terminal itself. If this is the case, the overall communication path over two cascaded mobile radio links, TMRN and MTGCRN, can be supervised centrally by a single fixed base station FBS without having to provide 'mobile intelligence' in the roaming relay station RRS itself.

Ex. 1007, 16:65-17:6.

The indirect coupling via the indirect coverage mobile radio network ICMRN allows the mobile terminals MT to be coupled to the fixed base stations FBS via relay stations RS which are less complex than the fixed base stations FBS in that they do not have to provide the above control and routing functions. These relay stations RS are in turn

Ex. 1007, 8:36-38.

No Motivation to Combine
Ground 2: *Vercauteren* and *Forssen*

Testimony of Carucel's Expert

The technical requirements for the relay stations were to be as basic as possible from a technical point of view and not provide any more technology in them than possible.

So the Vercauteren relay stations do not have any circuitry to support multiple antennas, no circuitry to receive the signals that would be received from the multiple antennas. There's no circuitry in Vercauteren in the relay station to determine, after the signals are received, which one of those signals may be the best signal nor is there any circuitry in the Vercauteren relay stations to combine multiple -- a plurality of signals into a single signal, if that's required.

Ex. 1035, 187:21–188:13.

No Motivation to Combine Ground 2: *Vercauteren* and *Forssen*

- As a result, Petitioner's combination would require adding complex circuitry to each Roaming Relay Station because *Vercauteren's* Relay Stations do not even have the circuitry to support either *Forssen's* components or functionality due to their "minimum intelligence.

- Second, a POSITA would not have been motivated to modify *Vercauteren* with *Forssen* because it would result in an inoperable device.

  - Since *Vercauteren's* relay stations are very limited in functionality, they do not even have the capability to process the multiple signals that would be received from the implementation of *Forssen's* antenna array.

No Motivation to Combine the Prior Art References

Ground 7: *Vercauteren and Gilhousen390*

- First, a POSITA would not have been motivated to modify *Vercauteren* with *Gilhousen390* because *Vercauteren* explicitly teaches away from utilizing a standard cellular network (i.e., *Gilhousen390's* system).
  - *Vercauteren* sets forth an alternative, non-standard wireless network in order to overcome *Vercauteren's* identified shortcomings of the known, standard cellular network.
  - *Gilhousen390* implements standard cellular fixed base stations; standard cellular mobile units; and a standard CDMA cellular protocols for communication between its fixed base stations and the mobile units.

No Motivation to Combine Ground 7: *Vercauteren* and *Gilhousen390*

- Second, a POSITA would not have been motivated to modify *Vercauteren* to implement *Gilhousen390's* CDMA signal diversity configurations because such a combination would be contrary to the stated objective for Vercauteren's relay stations.
  - Any added complexity would completely negate the benefits of the Relay Station's "minimum intelligence" due to the "commercial drawback" that would occur if such complex technology was implemented in each Relay Station because it "would require huge investments."

No Motivation to Combine Ground 7: *Vercauteren* and *Gilhousen390*

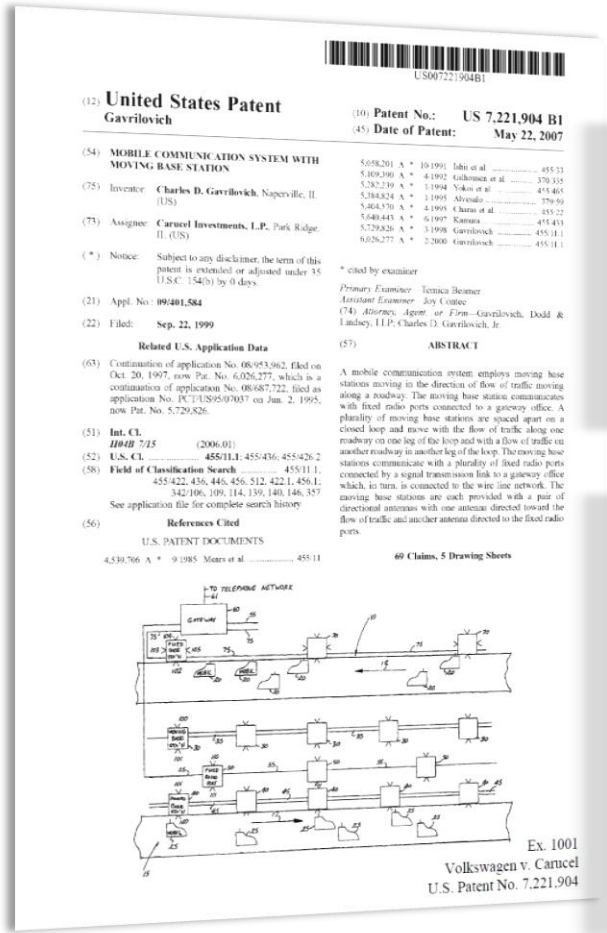
- Third, a POSITA would not have been motivated to modify *Vercauteren* with *Gilhousen390* because such a combination would not result in an operable device.
  - Since *Vercauteren's* relay stations are very limited in functionality, they do not have the capability to process multiple signals from a plurality of fixed ports that would result from the implementation of *Gilhousen390's* CDMA signal diversity configurations.

No Motivation to Combine the Prior Art References

Grounds 3 & 8: *Vercauteren and Forssen with Gilhousen390*

- For the same reasons set forth in Grounds 2 and 7, a POSITA would not have been motivated to combine *Vercauteren* and *Forssen* with *Gilhousen390*:
  - The Combination would be contrary to the stated objective for *Vercauteren's* relay stations.
  - The Combination would result in an inoperable device.
  - *Vercauteren* explicitly teaches away from utilizing a standard cellular network such as *Gilhousen390's* system.

Ground 1: *Gilhousen865* with *Gilhousen390*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

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5,404,570 A * 4/1995 Charas et al. 455/27
5,640,443 A * 6/1997 Kamura 455/433
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6,026,277 A * 2/2000 Gavrilovich 455/11.1

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Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claims 22 & 34

22. An apparatus adapted to move in accordance with a movement of a mobile unit moving relative to a plurality of fixed radio ports, the apparatus comprising:

. . .

34. An apparatus adapted to move in accordance with a movement of a plurality of mobile units moving relative to a plurality of fixed radio ports at a velocity greater than a relative velocity of movement between each of the mobile units of the plurality of mobile units, the apparatus comprising:

. . .

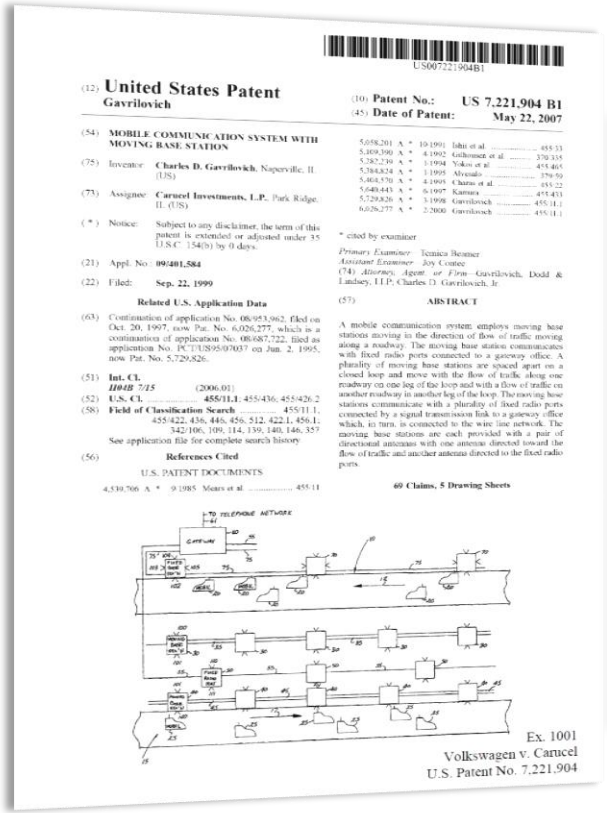
Ex. 1001, Claims 22 & 34.

Ground 1: Claims 22 & 34 – "Adapted to"

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Gilhousen865* and *Gilhousen390* do not disclose or render obvious "adapted to move" in the context of the entire '904 Patent:
  - Traffic or rate of speed of traffic is referring to "an automotive vehicle traveling on a roadway," not "airplane traffic".
  - *Gilhousen865* only discloses repeater that is installed on an airplane.
  - An airplane does not move with traffic as it is not bound to predetermined roads.
  - an airplane can travel at speeds up to five hundred miles-per-hour and, as such, does not move with the traffic at a rate of speed which is comparable to the traffic.

Ground 1: *Gilhousen865* with *Gilhousen390*

Independent Claims 22, 34, and 50



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/487,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**
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5,404,570 A * 4/1995 Charas et al. 455/22
5,640,443 A * 6/1997 Kamura 455/433
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

22. An apparatus adapted to move in accordance with a movement of a mobile unit moving relative to a plurality of fixed radio ports, the apparatus comprising:

. . .

a transmitter adapted to transmit, within the frequency band, a resultant signal to the mobile unit in accordance with at least one of the plurality of signals; and

a processor adapted to maximize an amount of transferred information to the mobile unit by evaluating a quality of each of the plurality of signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claim 22.

Ground 1: Claims 22, 34, and 50 – "Mobile Unit"

34. An apparatus adapted to move in accordance with a movement of a plurality of mobile units moving relative to a plurality of fixed radio ports at a velocity greater than a relative velocity of movement between each of the mobile units of the plurality of mobile units, the apparatus comprising:

. . .

a second radio interface adapted to communicate with the plurality of mobile units in the frequency bandwidth, the frequency having a lower limit greater than 300 megahertz; and

a processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports based on a plurality of signal quality indicators, each of the signal quality indicators corresponding to each of a plurality of transmitted signals transmitted from the plurality of fixed radio ports.

50. A method of providing a communication link between a communication network and a mobile unit having a motion relative to a plurality of fixed ports, wherein the plurality of fixed ports are communicatively coupled to the communication network, the method comprising the steps of:

. . .

transmitting, within the frequency band, a resultant signal to the mobile unit in accordance with at least one of the plurality of signals; and

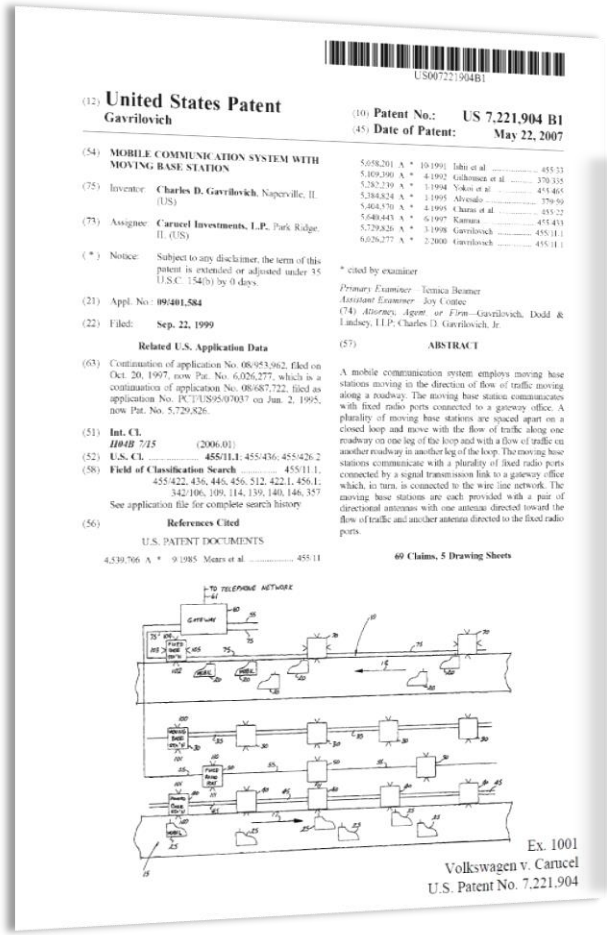
maximizing an amount of transferred information to the mobile unit by evaluating a quality of each of the plurality of signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claims 34, and 50.

Ground 1: Claims 22, 34, and 50 – "Mobile Unit"

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Gilhousen865* and *Gilhousen390* do not disclose or render obvious a "mobile unit" in the context of the entire '904 Patent:
  - *Gilhousen865* discloses that its radiotelephone is only able to communicate with a cellular network through the signal repeater or the alternative base station-type unit.
  - *Gilhousen865* discloses that its radiotelephone is not capable of registering with a cellular network by itself. Instead, *Gilhousen865*'s radiotelephone must rely on either the separate signal repeater or the alternative base station-type unit to perform this registration.

Ground 1: *Gilhousen865* with *Gilhousen390*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1, 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706 A * 9/1985 Mears et al. 455/11

5,058,201 A * 10/1991 Ishii et al. 455/33
5,109,390 A * 4/1992 Gilhousen et al. 370/335
5,282,239 A * 1/1994 Yokoi et al. 455/465
5,384,824 A * 1/1995 Alvesalo 379/59
5,404,570 A * 4/1995 Charas et al. 455/27
5,640,443 A * 6/1997 Kamura 455/433
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 22

22. An apparatus adapted to move in accordance with a movement of a mobile unit moving relative to a plurality of fixed radio ports, the apparatus comprising:

. . .

a transmitter adapted to transmit, within the frequency band, a resultant signal to the mobile unit in accordance with at least one of the plurality of signals; and

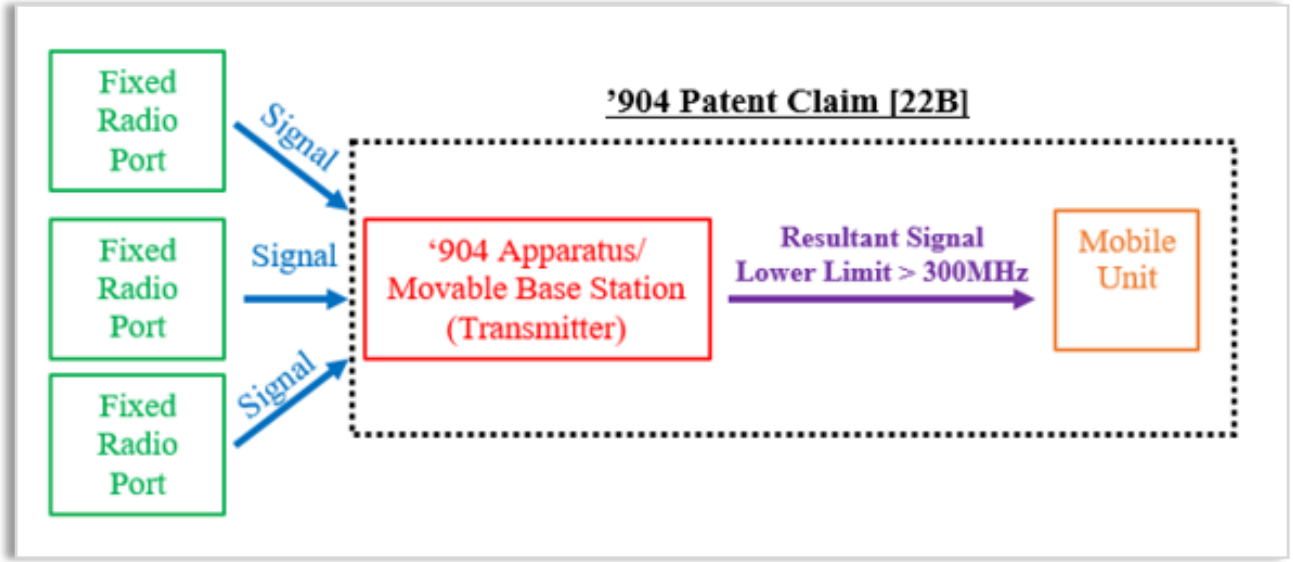
a processor adapted to maximize an amount of transferred information to the mobile unit by evaluating a quality of each of the plurality of signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claim 22.

Ground 1: Claim 22 – "Resultant Signal"

- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious any a moving base station that comprises a transmitter "adapted to transmit, within the frequency band, a resultant signal to the mobile unit."

Independent Claim 22

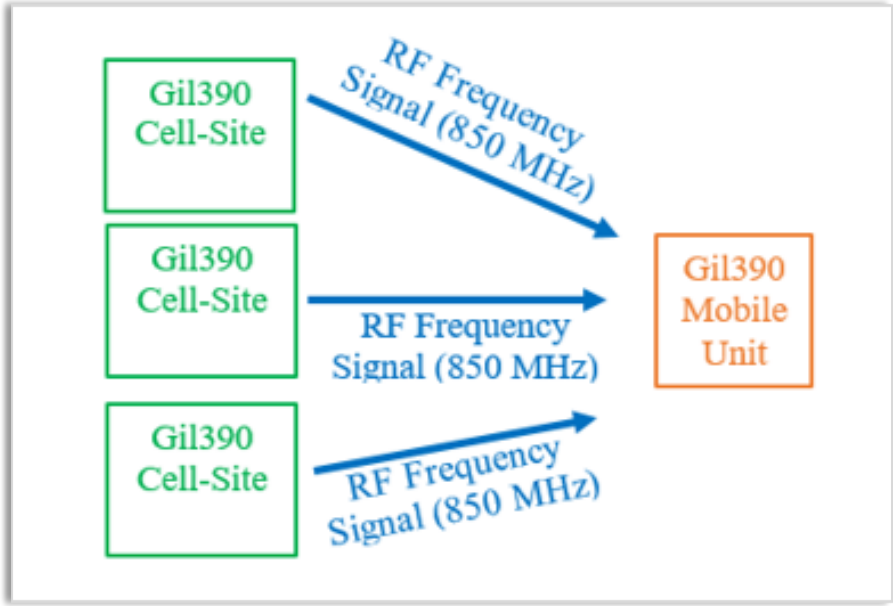


Lanning Decl. ¶183, Patent Owner's Demonstrative Figure 1..

Ground 1: Claim 22 – "Resultant Signal"

- Instead, *Gilhousen390* only discloses a fixed base station transmitting RF frequency signals <u>directly to the mobile unit</u>:

Gilhousen865's disclosure



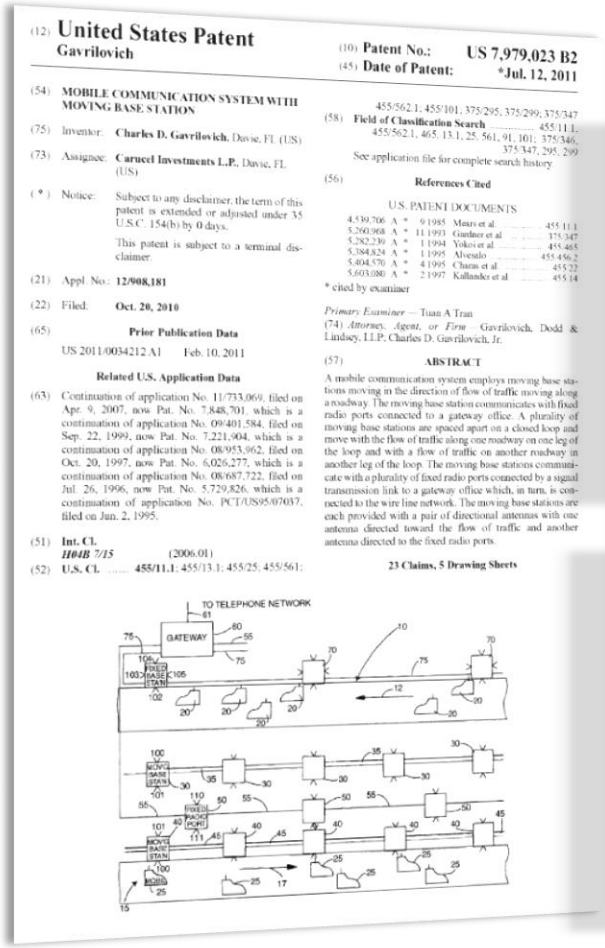
Lanning Decl. ¶185, Patent Owner's Demonstrative Figure 2.

Ground 1: *Gilhousen865 with Gilhousen390*

Dependent Claims 28, 29, 30, 31, 32, and 33

- Since the Petition fails to show that *Gilhousen865* in combination with *Gilhousen390* renders obvious all limitations of Claim 22, its challenges to Claims 28-33 fail for the same reasons.

Ground 1: *Gilhousen865 with Gilhousen390*



(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,979,023 B2**
(45) **Date of Patent: *Jul. 12, 2011**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/908,181**

(22) Filed: **Oct. 20, 2010**

(65) **Prior Publication Data**

US 2011/0034212 A1 Feb. 10, 2011

Related U.S. Application Data

(63) Continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07037, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search** 455/11.1, 455/562.1, 465, 13.1, 25, 561, 91, 101; 375/346, 375/347, 295, 299
See application file for complete search history

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5,404,570	A *	4/1995	Charas et al.	455/22
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Primary Examiner — Tuan A Tran
(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

23 Claims, 5 Drawing Sheets

Dependent Claims 28 & 30

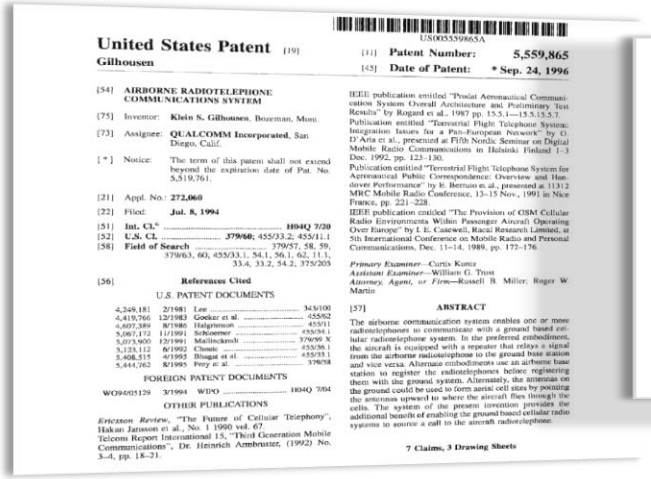
28. An apparatus in accordance with claim **22**, wherein the processor is further adapted to determine a best fixed radio port of the plurality of fixed radio ports, the best fixed radio port enabling the maximization of the amount of transferred information to the mobile unit.

30. An apparatus in accordance with claim **29**, wherein the processor is further adapted to determine a plurality of best fixed radio ports and to combine a group of signals of the plurality of signals to produce the resultant signal, the group of signals transmitted from the plurality of best fixed radio ports.

Ex. 1001, Claims 28 & 30.

Ground 1: Claims 28 & 30 – "Best Fixed Radio Port(s)"

- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious a "processor . . . adapted to determine a best fixed radio port(s)"
- Instead, *Gilhousen865* only discloses the method of "search[ing] for the strongest pilot signal from a ground base station and register[ing] with that base station":



United States Patent [19]
Gilhousen

[11] Patent Number: 5,559,865
[45] Date of Patent: * Sep. 24, 1996

[54] AIRBORNE RADIOTELEPHONE COMMUNICATIONS SYSTEM

[75] Inventor: Klein S. Gilhousen, Bozeman, Mont.

[73] Assignee: QUALCOMM Incorporated, San Diego, Calif.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,519,761.

[21] Appl. No.: 272,060

[22] Filed: Jul. 8, 1994

[51] Int. Cl.[6] H04Q 7/20

[52] U.S. Cl. 379/60; 455/33.2; 455/11.1

[58] Field of Search 379/57, 58, 59, 379/63, 60, 455/33.1, 54.1, 56.1, 62, 11.1, 33.4, 33.2, 54.2, 375/205

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Primary Examiner—Curtis Kuntz
Assistant Examiner—William G. Trost
Attorney, Agent, or Firm—Russell B. Miller; Roger W. Martin

[57] ABSTRACT

The airborne communication system enables one or more radiotelephones to communicate with a ground based cellular radiotelephone system. In the preferred embodiment, the aircraft is equipped with a repeater that relays a signal from the airborne radiotelephone to the ground base station and vice versa. Alternate embodiments use an airborne base station to register the radiotelephones before registering them with the ground system. Alternately, the antennas on the ground could be used to form aerial cell sites by pointing the antennas upward to where the aircraft flies through the cells. The system of the present invention provides the additional benefit of enabling the ground based cellular radio systems to source a call to the aircraft radiotelephone.

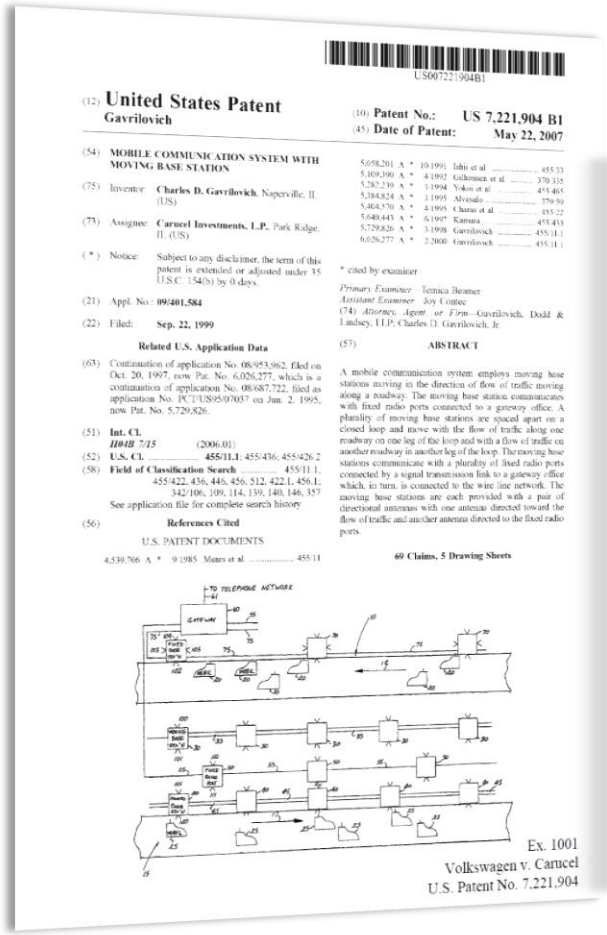
7 Claims, 3 Drawing Sheets

borne base station is illustrated in FIG. 4. Once the radiotelephone is registered with the aircraft base station, the aircraft base station then searches for the strongest pilot signal from a ground base station and registers with that base station.

Ex. 1005, 4:1-5.

- The strongest pilot signal ≠ "best fixed radio port(s)"

Ground 1: *Gilhousen865* with *Gilhousen390*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

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5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 34

34. An apparatus adapted to move in accordance with a movement of a plurality of mobile units moving relative to a plurality of fixed radio ports at a velocity greater than a relative velocity of movement between each of the mobile units of the plurality of mobile units, the apparatus comprising:

. . .

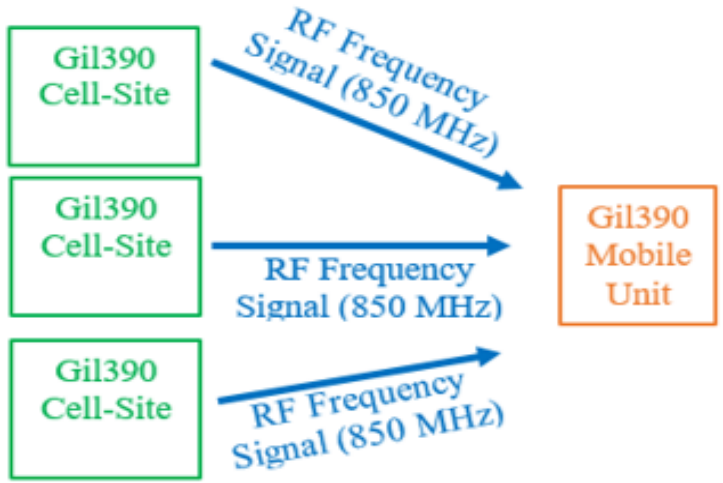
a second radio interface adapted to communicate with the plurality of mobile units in the frequency bandwidth, the frequency having a lower limit greater than 300 megahertz; and

. . .

Ex. 1001, Claim 34.

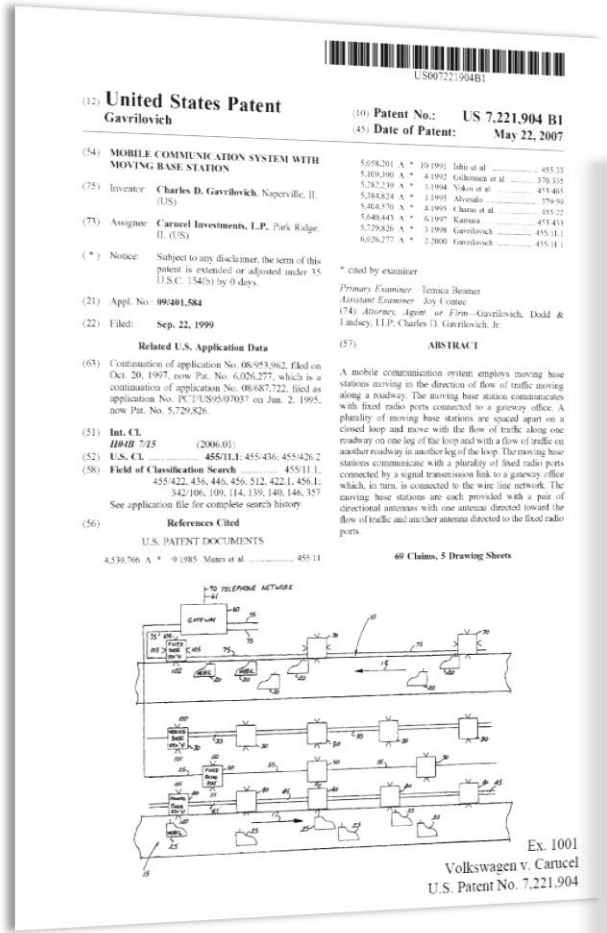
Ground 1: Claim 34 – "a second radio interface"

- *Gilhousen865* and *Gilhousen390* does not disclose or render obvious any moving base station comprised of "a second radio interface adapted to communicate with the plurality of mobile units . . . having a lower limit greater than 300 MHz."
- Instead, *Gilhousen390* discloses that its cell-sites (fixed base stations) transmit RF frequency signals directly to a mobile unit:



Lanning Decl. ¶185,
Patent Owner's Demonstrative Figure 2.

Ground 1: *Gilhousen865* with *Gilhousen390*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706 A * 9/1985 Mears et al. 455/11

5,058,201 A * 10/1991 Ishii et al. 455/33
5,109,390 A * 4/1992 Gilhousen et al. 370/335
5,287,239 A * 1/1994 Yokoi et al. 455/465
5,384,824 A * 1/1995 Alvesalo 379/59
5,404,570 A * 4/1995 Charas et al. 455/27
5,640,443 A * 6/1997 Kamura 455/433
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 34

34. An apparatus adapted to move in accordance with a movement of a plurality of mobile units moving relative to a plurality of fixed radio ports at a velocity greater than a relative velocity of movement between each of the mobile units of the plurality of mobile units, the apparatus comprising:

. . .

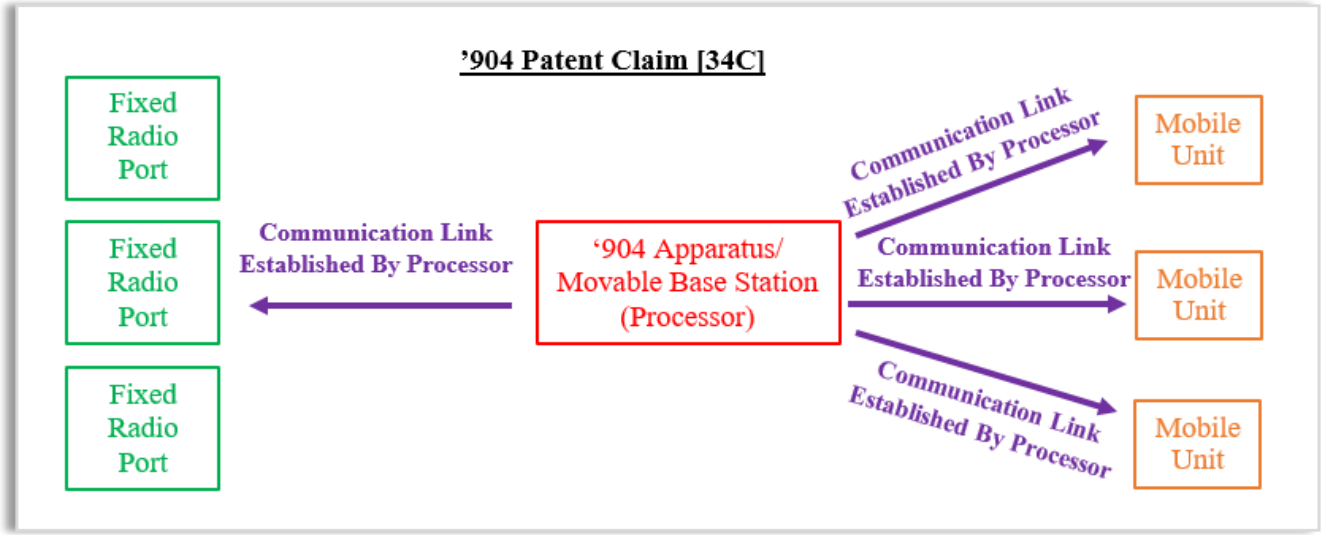
a processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports based on a plurality of signal quality indicators, each of the signal quality indicators corresponding to each of a plurality of transmitted signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claim 34.

Ground 1: Claim 34 – "Processor adapted to establish a communication link"

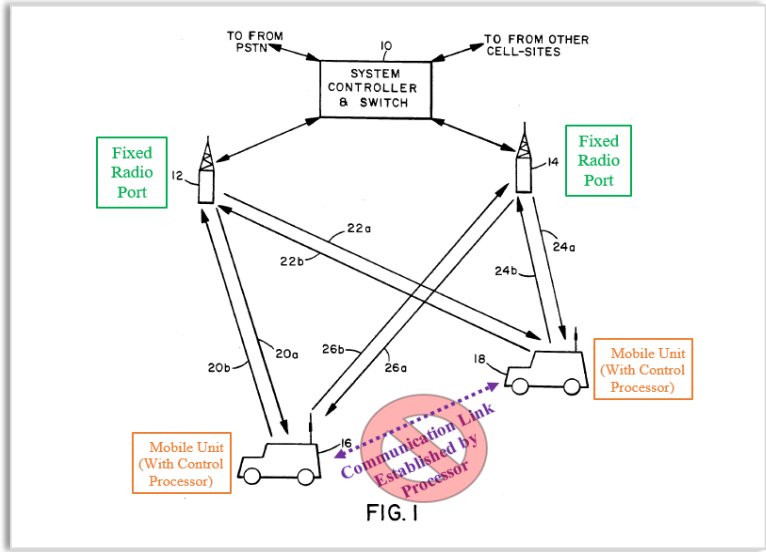
- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious any moving base station that comprises a "processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports":

Independent Claim 34



Lanning Decl. ¶205, Patent Owner's Demonstrative Figure 3.

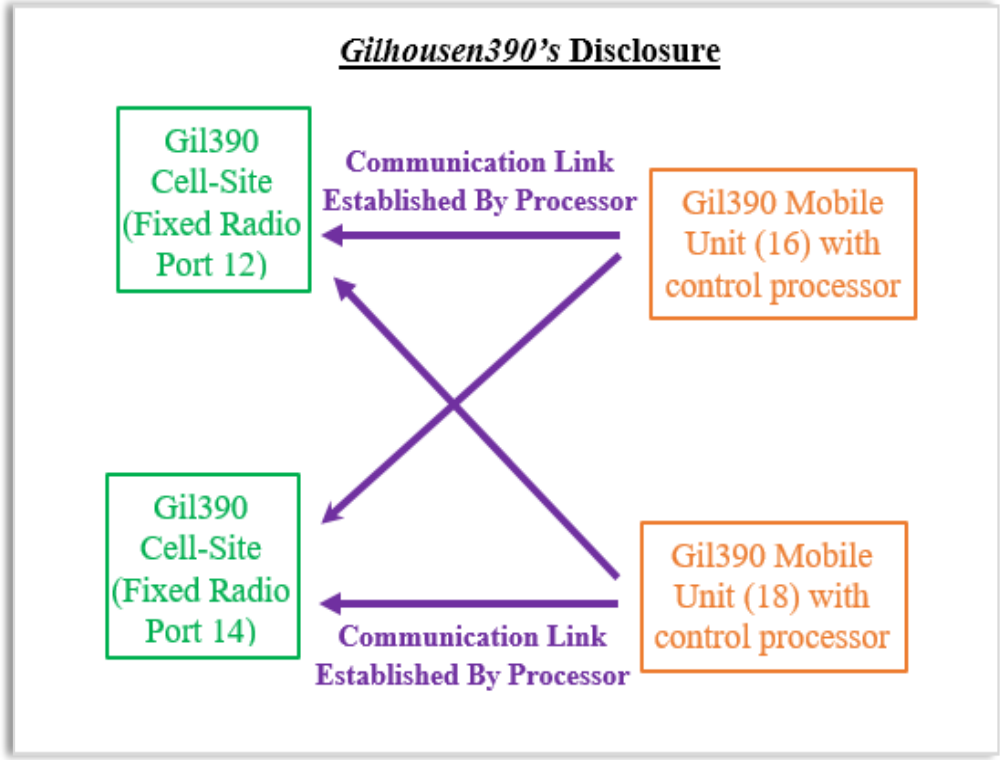
Gilhousen865's Disclosure



Ex. 1006, Figure 1 (annotated).

Ground 1: Claim 34 – "Processor adapted to establish a communication link"

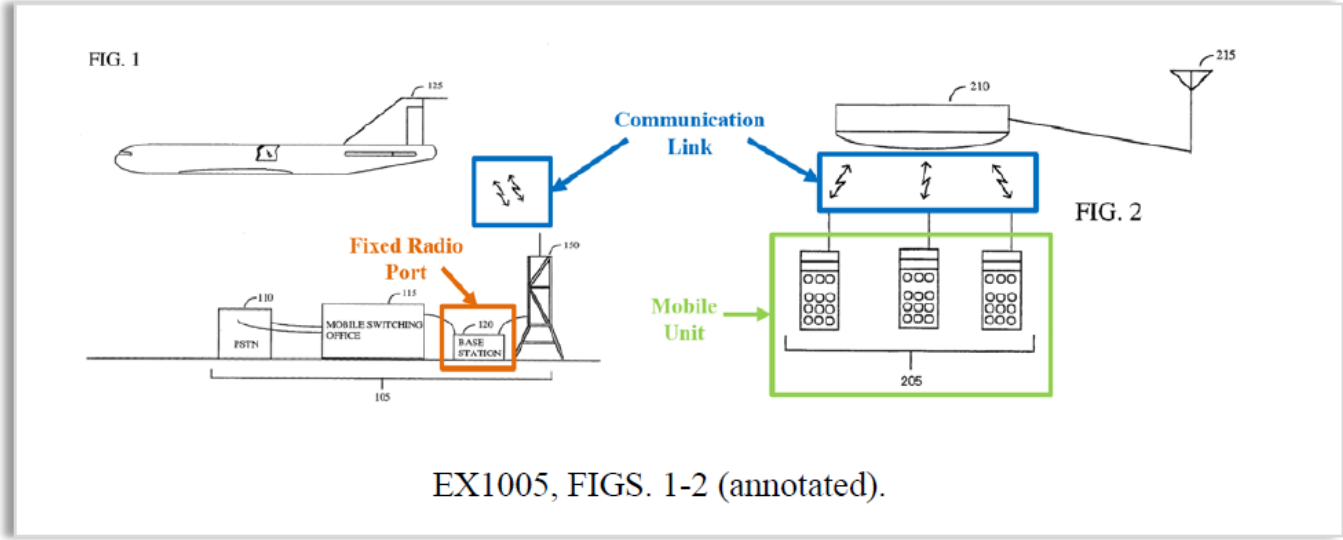
- Instead, *Gilhousen390's* mobile units are limited solely to their separate and direct connections with *Gilhousen390's* fixed base stations (12 & 14):



Lanning Decl. ¶207, Patent Owner's Demonstrative Figure 4.

Ground 1: Claim 34 – "Processor adapted to establish a communication link"

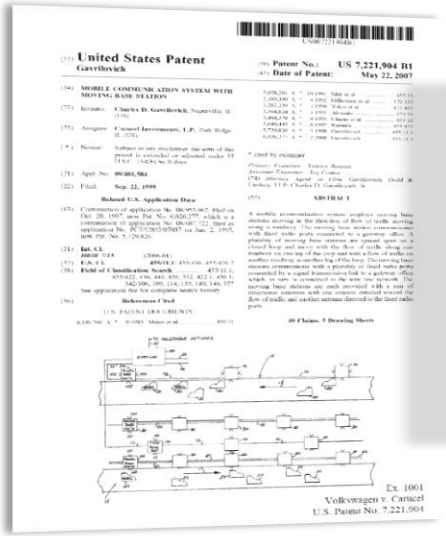
- *Gilhousen865* and *Gilhousen390* do not disclose or render obvious any moving base station that comprises a "processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports."
- Instead, *Gilhousen865* only discloses a communication link between a plurality of mobile units and a single fixed radio port:



EX1005, FIGS. 1-2 (annotated).

Ground 1: *Gilhousen865* with *Gilhousen390*

Dependent Claim 40

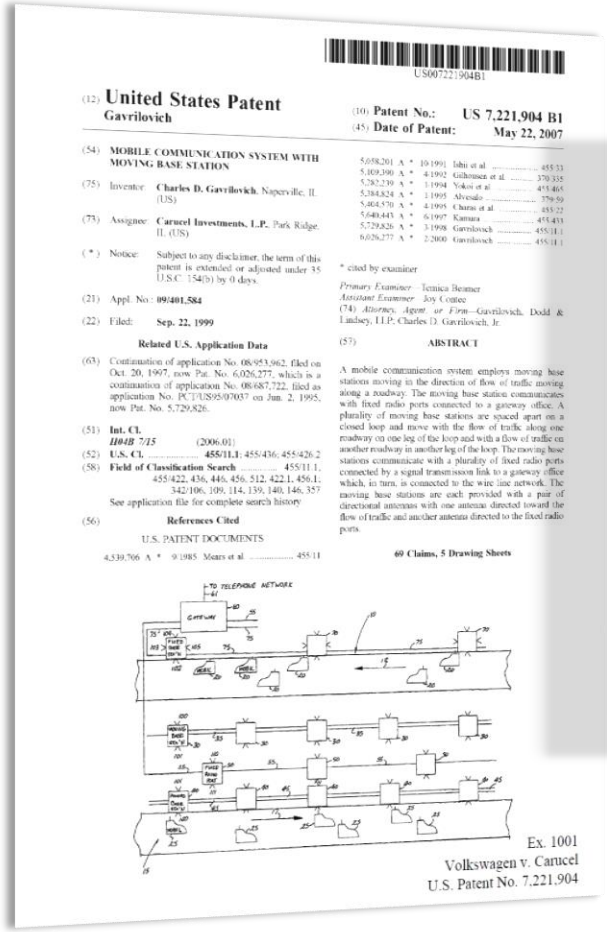


40. An apparatus in accordance with claim **34**, wherein the processor is further adapted to establish a second communication link between the plurality of mobile units and at least a second fixed radio port of the plurality of fixed radio ports based on the plurality of signal quality indicators.

Ex. 1001, Claim 40.

- Since the Petition fails to show that *Gilhousen865* in combination with *Gilhousen390* renders obvious all limitations of Claim 34, its challenge to Claim 40 fails for the same reasons.

Ground 2: *Vercauteren* with *Forssen*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history

(56) **References Cited**

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5,109,390 A * 4/1992 Gilhousen et al. 370/335
5,282,239 A * 1/1994 Yokoi et al. 455/465
5,384,824 A * 1/1995 Alvesalo 379/59
5,404,570 A * 4/1995 Charas et al. 455/22
5,640,443 A * 6/1997 Kimura 455/431
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 22

22. An apparatus adapted to move in accordance with a movement of a mobile unit moving relative to a plurality of fixed radio ports, the apparatus comprising:

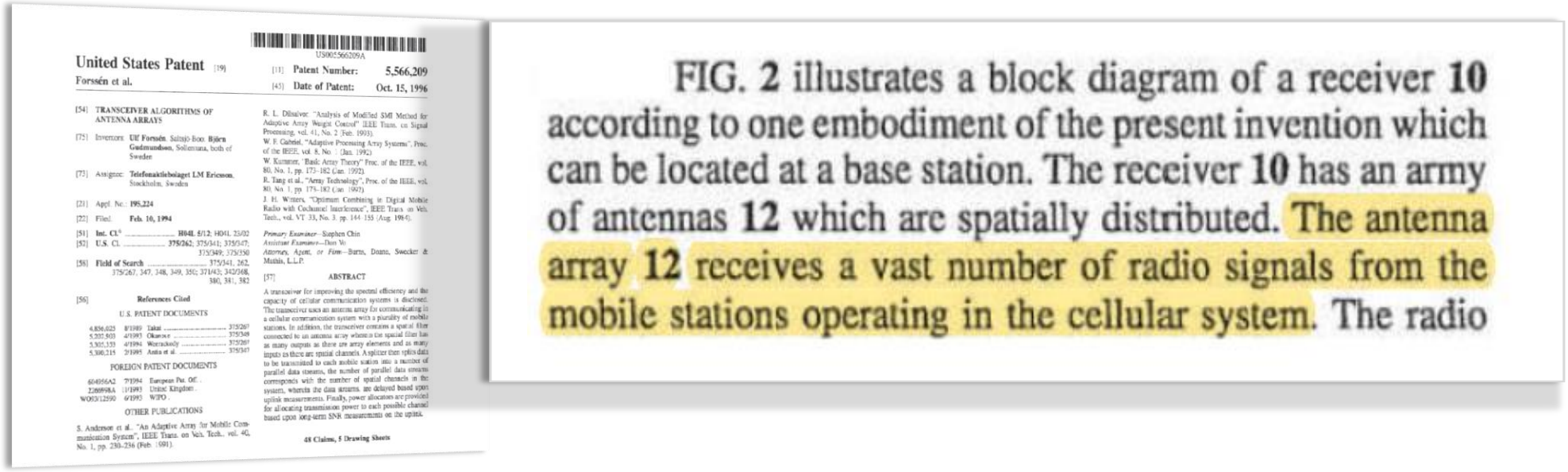
a receiver adapted to receive a plurality of signals, each of the plurality of signals transmitted from each of the plurality of fixed radio ports within a frequency band having a lower limit greater than 300 megahertz;

. . .

Ex. 1001, Claim 22.

Ground 2: Claim 22 –"plurality of signals . . . transmitted from each of the plurality of fixed radio ports"

- *Vercauteren and Forssen* do not disclose or render obvious "a receiver adapted to receive a plurality of signals . . . transmitted from each of the plurality of <u>fixed radio ports</u>."
- Instead, *Forssen* only discloses a fixed base station "receiv[ing] a vast number of radio signals from the <u>mobile stations</u>":



US005566209A

United States Patent [19]
Forssén et al.

[11] Patent Number: 5,566,209
[45] Date of Patent: Oct. 15, 1996

[54] TRANSCEIVER ALGORITHMS OF ANTENNA ARRAYS

[75] Inventors: Ulf Forssén, Saltsjö-Boo; Björn Gudmundson, Sollentuna, both of Sweden

[73] Assignee: Telefonaktiebolaget LM Ericsson, Stockholm, Sweden

[21] Appl. No.: 195,224

[22] Filed: Feb. 10, 1994

[51] Int. Cl.[6] H04L 5/12; H04L 25/02

[52] U.S. Cl. 375/262; 375/341; 375/347; 375/349; 375/350

[58] Field of Search 375/341, 262, 375/267, 347, 348, 349, 350; 371/43; 342/368, 380, 381, 382

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R. Tang et al., "Array Technology", Proc. of the IEEE, vol. 80, No. 1, pp. 173-182 (Jan. 1992)

J. H. Winters, "Optimum Combining in Digital Mobile Radio with Cochannel Interference", IEEE Trans on Veh. Tech., vol. VT-33, No. 3, pp. 144-155 (Aug. 1984).

Primary Examiner—Stephen Chin
Assistant Examiner—Don Vo
Attorney, Agent, or Firm—Burns, Doane, Swecker & Mathis, L.L.P.

[57] ABSTRACT

A transceiver for improving the spectral efficiency and the capacity of cellular communication systems is disclosed. The transceiver uses an antenna array for communicating in a cellular communication system with a plurality of mobile stations. In addition, the transceiver contains a spatial filter connected to an antenna array wherein the spatial filter has as many outputs as there are array elements and as many inputs as there are spatial channels. A splitter then splits data to be transmitted to each mobile station into a number of parallel data streams, the number of parallel data streams corresponds with the number of spatial channels in the system, wherein the data streams are delayed based upon uplink measurements. Finally, power allocators are provided for allocating transmission power to each possible channel based upon long-term SNR measurements on the uplink.

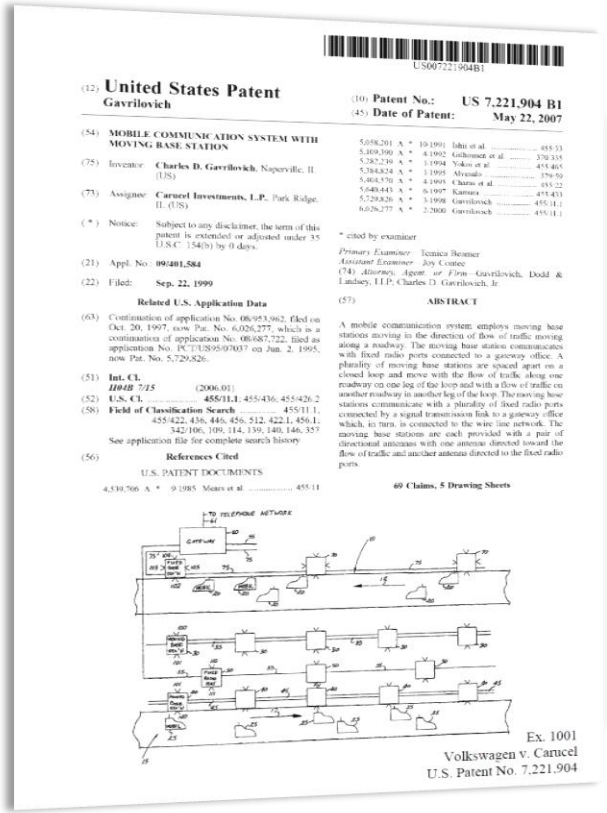
48 Claims, 5 Drawing Sheets

FIG. 2 illustrates a block diagram of a receiver **10** according to one embodiment of the present invention which can be located at a base station. The receiver **10** has an army of antennas **12** which are spatially distributed. The antenna array **12** receives a vast number of radio signals from the mobile stations operating in the cellular system. The radio

Ex. 1008, 4: 4:17-20.

Ground 2: *Vercauteren with Forssen*

Independent Claims 22, 34, and 50



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/487,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357

See application file for complete search history.

(56) **References Cited**

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4,539,706 A * 9/1985 Mears et al. 455/11

5,058,201 A * 10/1991 Ishii et al. 455/33
5,369,390 A * 4/1992 Gilhousen et al. 370/335
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5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner Temica Beamer
Assistant Examiner Joy Contee
(74) *Attorney, Agent, or Firm* Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

22. An apparatus adapted to move in accordance with a movement of a mobile unit moving relative to a plurality of fixed radio ports, the apparatus comprising:

. . .

a transmitter adapted to transmit, within the frequency band, a resultant signal to the mobile unit in accordance with at least one of the plurality of signals; and

a processor adapted to maximize an amount of transferred information to the mobile unit by evaluating a quality of each of the plurality of signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claim 22.

Ground 2: Claims 22, 34, and 50 – "Mobile Unit"

34. An apparatus adapted to move in accordance with a movement of a plurality of mobile units moving relative to a plurality of fixed radio ports at a velocity greater than a relative velocity of movement between each of the mobile units of the plurality of mobile units, the apparatus comprising:

. . .

a second radio interface adapted to communicate with the plurality of mobile units in the frequency bandwidth, the frequency having a lower limit greater than 300 megahertz; and

a processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports based on a plurality of signal quality indicators, each of the signal quality indicators corresponding to each of a plurality of transmitted signals transmitted from the plurality of fixed radio ports.

50. A method of providing a communication link between a communication network and a mobile unit having a motion relative to a plurality of fixed ports, wherein the plurality of fixed ports are communicatively coupled to the communication network, the method comprising the steps of:

. . .

transmitting, within the frequency band, a resultant signal to the mobile unit in accordance with at least one of the plurality of signals; and

maximizing an amount of transferred information to the mobile unit by evaluating a quality of each of the plurality of signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claims 34, and 50.

Ground 2: Claims 22, 34, and 50 – "Mobile Unit"

- *Vercauteren* and *Forssen* do not disclose or render obvious a "mobile unit" in the context of the entire '904 Patent.
- First, *Vercauteren* only discloses that its Mobile Terminals are non-standard phones designed to communicate with the alternative, non-standard wireless network of Vercauteren's invention via non-standard relay stations.
  - *Vercauteren's* Mobile Terminals do not operate on a standard cellular network.
  - *Vercauteren's* Mobile Terminals do not utilize standard cellular protocols for communication.

Ground 2: Claims 22, 34, and 50 – "Mobile Unit"

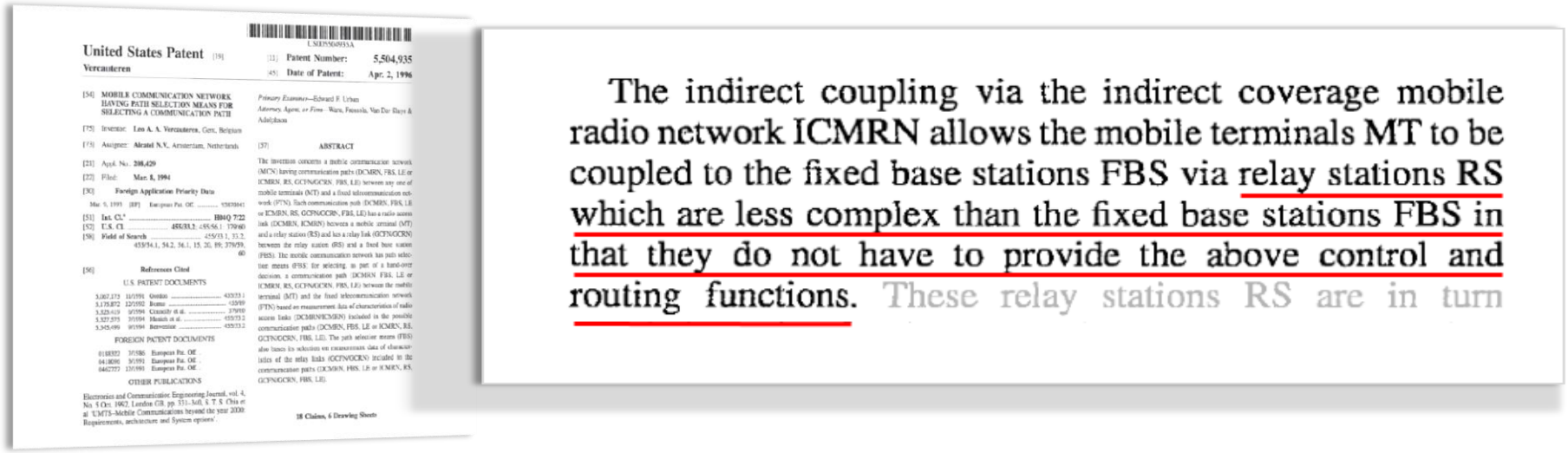
- Since *Vercauteren's* Mobile Terminals do not operate on a standard cellular network or utilize standard cellular protocols for communication:
  - *Vercauteren's* Mobile Terminals are not capable of directly communicating with a fixed cellular base station; and
  - Vercauteren's Mobile Terminals are not capable of registering with a cellular network.

Ground 2: Claims 22, 34, and 50 – "Mobile Unit"

- Second, *Vercauteren* also does not disclose any ability of its Mobile Terminals to communicate with any "moving base stations" in the context of the '904 Patent.
- Instead, the only moving apparatus in *Vercauteren* that is capable of communicating with the Mobile Terminal is the Roaming Relay Station (RRS)—that is purposely:
  - (i) limited to "minimum intelligence";
  - (ii) lack "mobile intelligence"; and
  - (iii) do not contain any type of base station functionality due to complexity and economic reasons.

Ground 2: Claims 22, 34, and 50 – "Mobile Unit"

- Third, *Vercauteren* explicitly differentiates its Roaming Relay Stations from base stations and movable base stations by disclosing that its roaming relay stations do "not have to provide the [] control and routing functions" of a base station:



United States Patent [19]
Vercauteren

[11] Patent Number: 5,504,935
[45] Date of Patent: Apr. 2, 1996

[54] MOBILE COMMUNICATION NETWORK HAVING PATH SELECTION MEANS FOR SELECTING A COMMUNICATION PATH

[75] Inventor: Leo A. A. Vercauteren, Gent, Belgium

[73] Assignee: Alcatel N.V., Amsterdam, Netherlands

[21] Appl. No.: 208,429

[22] Filed: Mar. 8, 1994

[30] Foreign Application Priority Data

[51] Int. Cl.[6] H04Q 7/22
[52] U.S. Cl. 455/33.2; 455/56.1; 379/60
[58] Field of Search 455/33.1, 33.2, 54.1, 54.2, 56.1, 15, 20, 89; 379/59, 60

[56] References Cited

U.S. PATENT DOCUMENTS

FOREIGN PATENT DOCUMENTS

OTHER PUBLICATIONS

Primary Examiner—Edward F. Urban
Attorney, Agent, or Firm—Watts, Hanscha, Van Der Sluys & Adolphson

[57] ABSTRACT

18 Claims, 6 Drawing Sheets

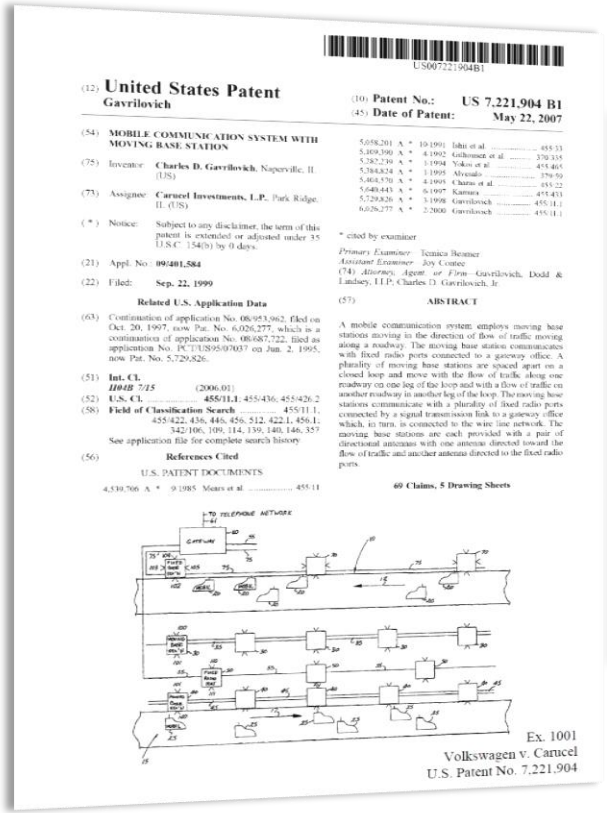
The indirect coupling via the indirect coverage mobile radio network ICMRN allows the mobile terminals MT to be coupled to the fixed base stations FBS via relay stations RS which are less complex than the fixed base stations FBS in that they do not have to provide the above control and routing functions. These relay stations RS are in turn

Ex. 1007, 8:36-38.

- As a result, *Vercauteren's* Roaming Relay Stations do not facilitate the communications between the mobile terminals and the fixed base stations.

Ground 2: *Vercauteren with Forssen*

Independent Claim 22



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(51) **Int. Cl.**
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Assistant Examiner Joy Contee
(74) *Attorney, Agent, or Firm* Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

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69 Claims, 5 Drawing Sheets

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Volkswagen v. Carucel
U.S. Patent No. 7,221,904

22. An apparatus adapted to move in accordance with a movement of a mobile unit moving relative to a plurality of fixed radio ports, the apparatus comprising:

. . .

a processor adapted to maximize an amount of transferred information to the mobile unit by evaluating a quality of each of the plurality of signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claim 22.

Ground 2: Claim 22 –"Moving Base Station . . . To Evaluate"

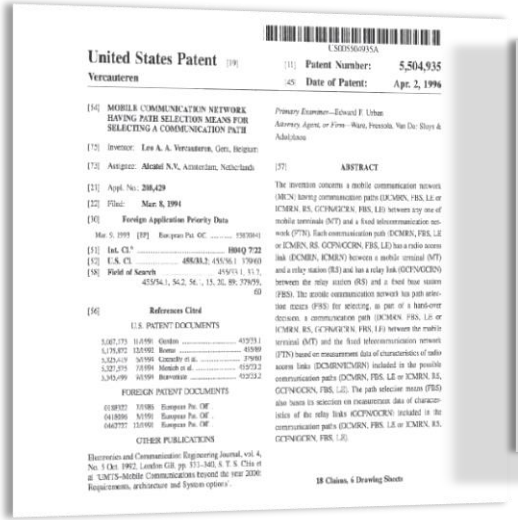
- *Vercauteren* and *Forssen* do not disclose or render obvious any moving base station that comprises "a processor adapted to . . . Evaluat[e] a quality of each of the plurality of signals transmitted from the . . . fixed radio ports."

- First, the only moving apparatus in *Vercauteren* that is capable of communicating with the Mobile Terminal is the Roaming Relay Station (RRS).

  - As admitted by Petitioner and Dr. Ding, *Vercauteren* fails to disclose "a processor" as part of its Roaming Relay Station (RRS).

Ground 2: Claim 22 –"Moving Base Station . . . To Evaluate"

- Second, *Vercauteren's* Roaming Relay Station (RRS) is purposely limited to "minimum intelligence".
  - As a result, the Roaming Relay Station (RRS) is not capable of collecting or organizing measurement data.
- Instead, *Vercauteren* repeatedly discloses that the function of "collecting and organizing measurement data" is actually performed by the Mobile Terminal (MT):



United States Patent [19]
Vercauteren

[11] Patent Number: 5,504,935
[45] Date of Patent: Apr. 2, 1996

[54] MOBILE COMMUNICATION NETWORK HAVING PATH SELECTION MEANS FOR SELECTING A COMMUNICATION PATH

[75] Inventor: Leo A. A. Vercauteren, Gen, Belgium

[73] Assignee: Alcatel N.V., Amsterdam, Netherlands

[21] Appl. No.: 288,429

[22] Filed: Mar. 8, 1994

[30] Foreign Application Priority Data

[51] Int. Cl.[6] H04Q 7/22

[52] U.S. Cl. 455/56.1; 370/60

[58] Field of Search ..... 455/56.1, 33.1, 455/54.1, 54.2, 56. , 15, 20, 89; 379/59, 60

[56] References Cited

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OTHER PUBLICATIONS

Primary Examiner—Edward F. Urban
Attorney, Agent, or Firm—Ware, Fressola, Van Der Sluys & Adolphson

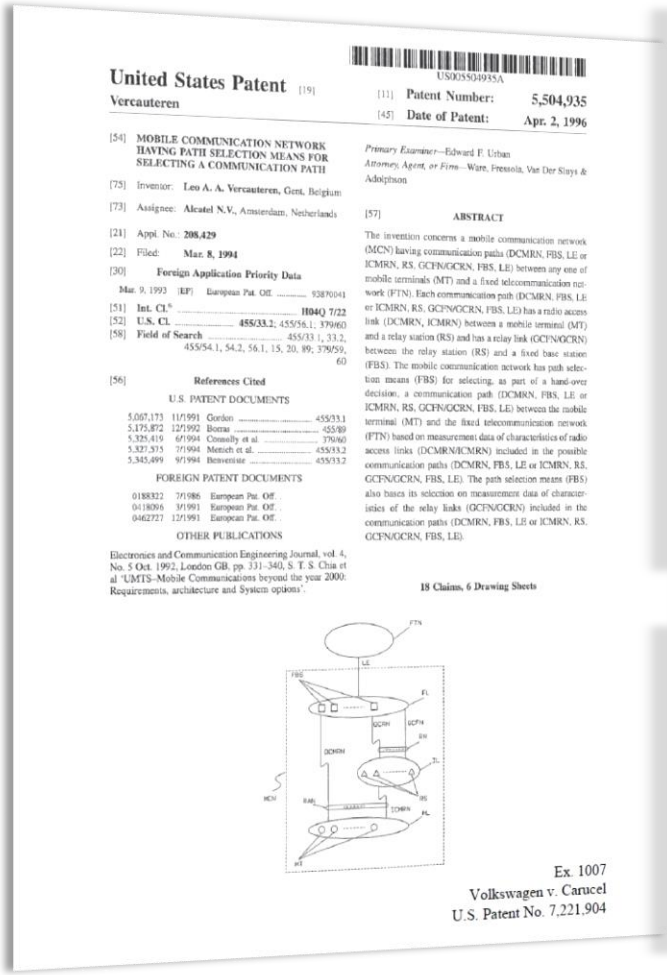
[57] ABSTRACT

18 Claims, 6 Drawing Sheets

This object is achieved due to the fact that it includes a tracking step in which said measurement data are collected in and organized by said one mobile terminal, a forwarding step in which said organized measurement data are forwarded to said path selection means which are included in said one base station, a decision step and an execution step in which said hand-over decision is made and executed by said selection means based on said organized measurement data respectively.

Ex. 1007, 4:54-62.

Ground 2: Claim 22 –"Moving Base Station . . . To Evaluate"



US005504935A

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Mar. 9, 1993 [EP] European Pat. Off. 93870041

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[52] U.S. Cl. 455/33.2; 455/56.1; 379/60

[58] Field of Search 455/33.1, 33.2, 455/54.1, 54.2, 56.1, 15, 20, 89; 379/59, 60

[56] References Cited

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5,325,419	6/1994	Connolly et al.	379/60
5,327,575	7/1994	Menich et al.	455/33.2
5,345,499	9/1994	Benveniste	455/33.2

FOREIGN PATENT DOCUMENTS

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0418096	3/1991	European Pat. Off. .
0462727	12/1991	European Pat. Off. .

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Primary Examiner—Edward F. Urban
Attorney, Agent, or Firm—Ware, Fressola, Van Der Sluys & Adolphson

[57] ABSTRACT

The invention concerns a mobile communication network (MCN) having communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) between any one of mobile terminals (MT) and a fixed telecommunication network (FTN). Each communication path (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) has a radio access link (DCMRN, ICMRN) between a mobile terminal (MT) and a relay station (RS) and has a relay link (GCFN/GCRN) between the relay station (RS) and a fixed base station (FBS). The mobile communication network has path selection means (FBS) for selecting, as part of a hand-over decision, a communication path (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) between the mobile terminal (MT) and the fixed telecommunication network (FTN) based on measurement data of characteristics of radio access links (DCMRN/ICMRN) included in the possible communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE). The path selection means (FBS) also bases its selection on measurement data of characteristics of the relay links (GCFN/GCRN) included in the communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE).

18 Claims, 6 Drawing Sheets

Ex. 1007
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

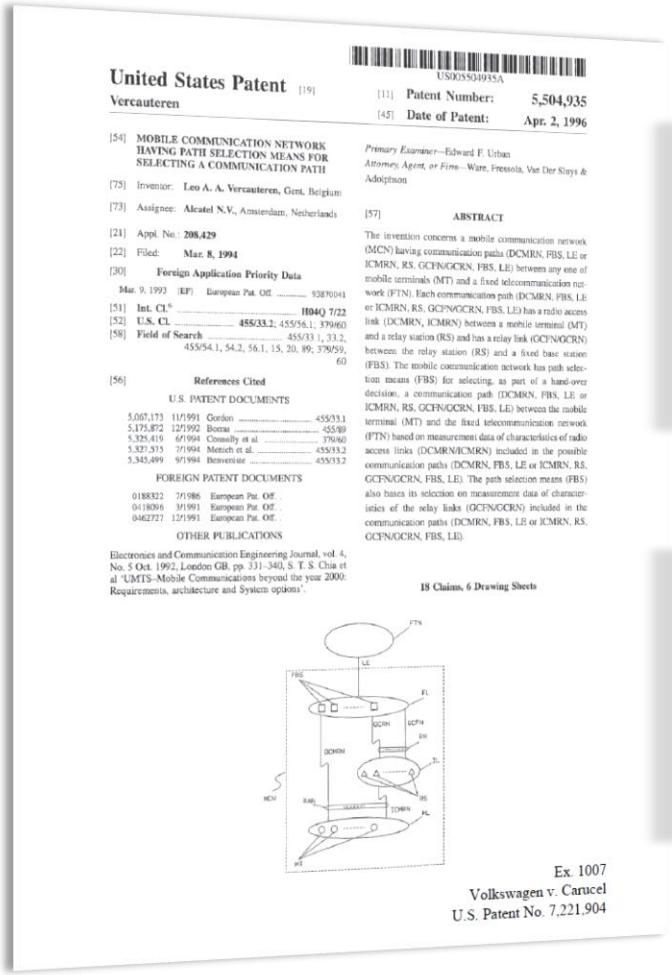
In this way, the fixed base station used to couple one of the mobile terminals to the fixed network is also used as the means to make and execute the hand-over decision. Moreover, by providing a tracking step in which both the radio link and the relay link measurement data are gathered in the mobile terminal, the signalling load associated to the hand-over protocol is clearly removed from the fixed network. This is advantageous since such signalling load on the fixed network is unallowable because the structure of this fixed network is unknown and cannot be relied upon, i.e. it cannot be guaranteed that its structure is suited for the vital signalling needed in the hand-over protocol.

Ex. 1007, 4:65-5:7.

The present hand-over protocol thus uses the most suitable place for collecting both the radio link and relay link measurement data, i.e. the mobile terminal, since the latter is the sole consistent part of the communication between itself and the fixed network if the latter may not be used for hand-over signalling.

Ex. 1007, 5:8-13.

Ground 2: Claim 22 –"Moving Base Station . . . To Evaluate"



United States Patent [19]
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[52] U.S. Cl. 455/33.2; 455/56.1; 379/60

[58] Field of Search 455/33.1, 33.2, 455/54.1, 54.2, 56.1, 15, 20, 89; 379/59, 60

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18 Claims, 6 Drawing Sheets

Ex. 1007
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

The tracking step is then concluded by the mobile terminal MT1 by organizing all the information measured or extracted by it from the received tracking signals in a communication tree including the radio access links and relay links shown dashed.

Ex. 1007, 10:50-54.

In the forwarding step it is therefore this tree organizing all measurement data which is forwarded by the mobile terminal MT1 over the actual communication path, shown in full line, to the actual controlling fixed base station FBS1.

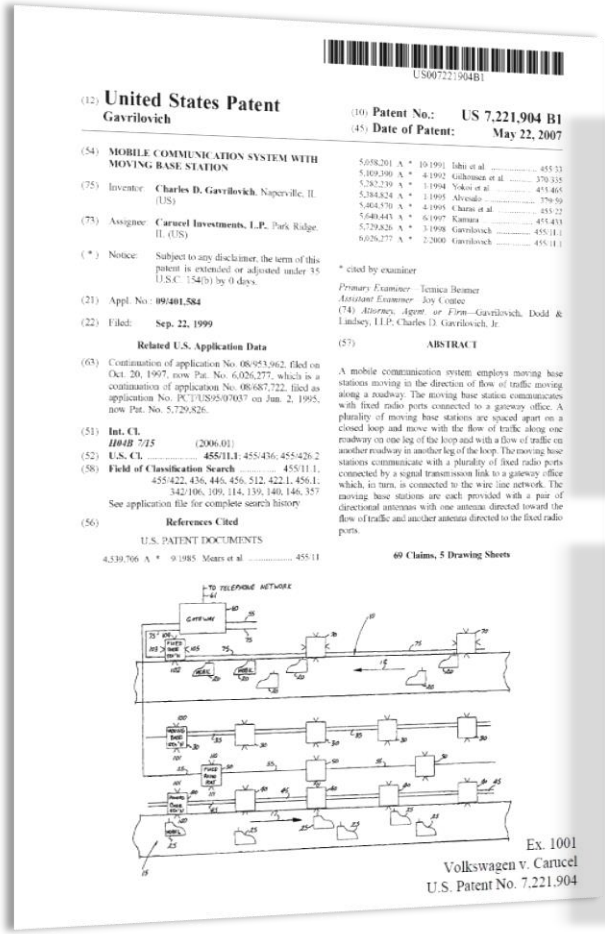
Ex. 1007, 5:8-13.

Ground 2: *Vercauteren* with *Forssen*

Dependent Claims 28, 29, 32, and 33

- Since the Petition fails to show that *Vercauteren* in combination with *Forssen* renders obvious all limitations of Claim 22, its challenges to Claims 28, 29, 32 and 33 fail for the same reasons.

Ground 2: *Vercauteren with Forssen*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

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(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history

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Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

69 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Dependent Claims 28 & 30

28. An apparatus in accordance with claim **22**, wherein the processor is further adapted to determine a best fixed radio port of the plurality of fixed radio ports, the best fixed radio port enabling the maximization of the amount of transferred information to the mobile unit.

30. An apparatus in accordance with claim **29**, wherein the processor is further adapted to determine a plurality of best fixed radio ports and to combine a group of signals of the plurality of signals to produce the resultant signal, the group of signals transmitted from the plurality of best fixed radio ports.

Ex. 1001, Claims 28 & 30.

Ground 2: Claims 28 & 30 – "Best Fixed Radio Port(s)"

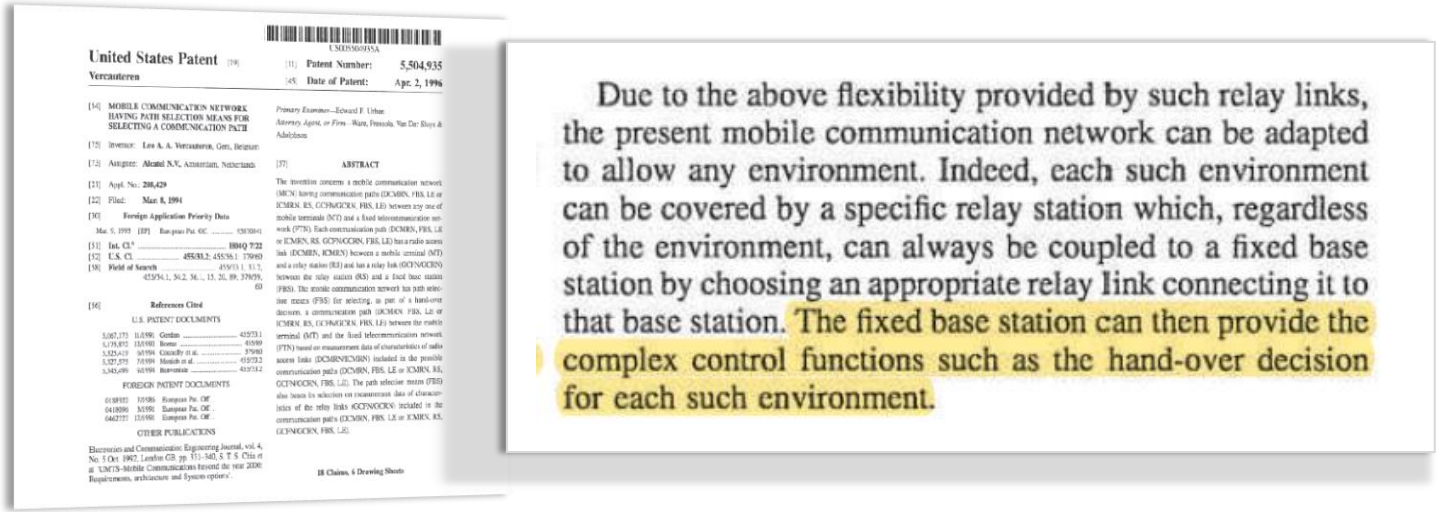
- *Vercauteren* and *Forssen* do not disclose or render obvious any moving base station that comprises a "processor . . . adapted to determine a best fixed radio port(s)".

- First, the only moving apparatus in *Vercauteren* that is capable of communicating with the Mobile Terminal is the Roaming Relay Station (RRS).

  - As admitted by Petitioner and Dr. Ding, *Vercauteren* fails to disclose "a processor" as part of its Roaming Relay Station (RRS).

Ground 2: Claims 28 & 30 – "Best Fixed Radio Port(s)"

- Second, *Vercauteren's* Roaming Relay Station (RRS) is purposely limited to "minimum intelligence".
  - As a result, the Roaming Relay Station (RRS) is not capable of selecting the optimal communication path.
- Instead, *Vercauteren* repeatedly discloses that the function of "select[ing]...the optimal communication path" is actually performed by the Fixed Base Station (FBS1):



United States Patent [19]
Vercauteren

[11] Patent Number: 5,504,935
[45] Date of Patent: Apr. 2, 1996

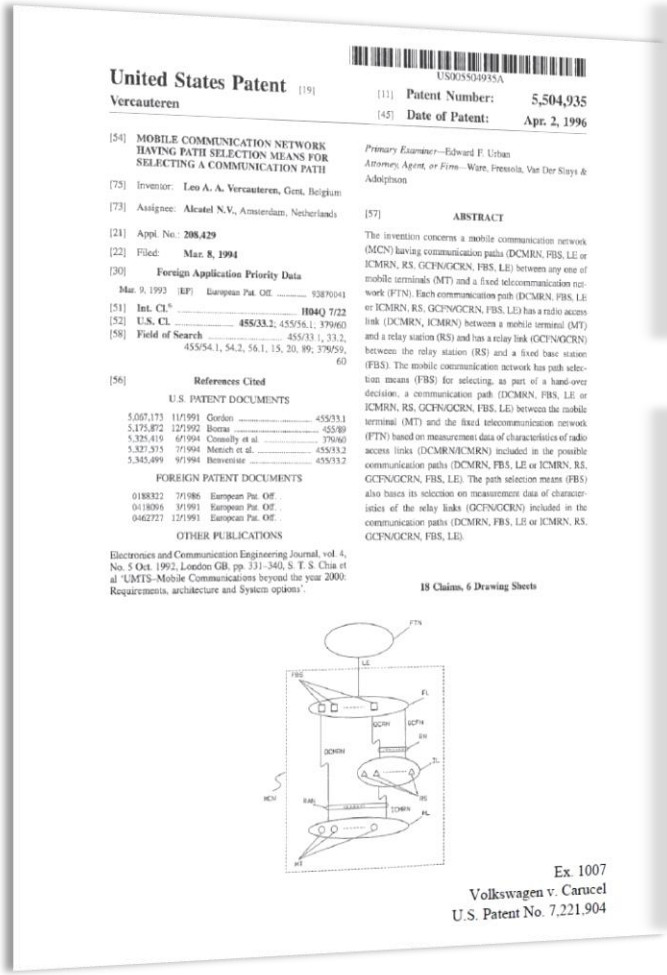
[54] MOBILE COMMUNICATION NETWORK HAVING PATH SELECTION MEANS FOR SELECTING A COMMUNICATION PATH

[57] ABSTRACT

Due to the above flexibility provided by such relay links, the present mobile communication network can be adapted to allow any environment. Indeed, each such environment can be covered by a specific relay station which, regardless of the environment, can always be coupled to a fixed base station by choosing an appropriate relay link connecting it to that base station. The fixed base station can then provide the complex control functions such as the hand-over decision for each such environment.

Ex. 1007, 2:23-31.

Ground 2: Claim 22 –"Moving Base Station . . . To Evaluate"



US005504935A

United States Patent [19]
Vercauteren

[11] **Patent Number: 5,504,935**
[45] **Date of Patent: Apr. 2, 1996**

[54] **MOBILE COMMUNICATION NETWORK HAVING PATH SELECTION MEANS FOR SELECTING A COMMUNICATION PATH**

[75] Inventor: **Leo A. A. Vercauteren**, Gent, Belgium

[73] Assignee: **Alcatel N.V.**, Amsterdam, Netherlands

[21] Appl. No.: **208,429**

[22] Filed: **Mar. 8, 1994**

[30] **Foreign Application Priority Data**

Mar. 9, 1993 [EP] European Pat. Off. 93870041

[51] **Int. Cl.**[6] **H04Q 7/22**

[52] **U.S. Cl.** **455/33.2**; 455/56.1; 379/60

[58] **Field of Search** 455/33.1, 33.2, 455/54.1, 54.2, 56.1, 15, 20, 89; 379/59, 60

[56] **References Cited**

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Electronics and Communiction Engineering Journal, vol. 4, No. 5 Oct. 1992, London GB, pp. 331–340, S. T. S. Chia et al 'UMTS–Mobile Communications beyond the year 2000: Requirements, architecture and System options'.

Primary Examiner—Edward F. Urban
Attorney, Agent, or Firm—Ware, Fressola, Van Der Sluys & Adolphson

[57] **ABSTRACT**

The invention concerns a mobile communication network (MCN) having communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) between any one of mobile terminals (MT) and a fixed telecommunication network (FTN). Each communication path (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) has a radio access link (DCMRN, ICMRN) between a mobile terminal (MT) and a relay station (RS) and has a relay link (GCFN/GCRN) between the relay station (RS) and a fixed base station (FBS). The mobile communication network has path selection means (FBS) for selecting, as part of a hand-over decision, a communication path (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE) between the mobile terminal (MT) and the fixed telecommunication network (FTN) based on measurement data of characteristics of radio access links (DCMRN/ICMRN) included in the possible communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE). The path selection means (FBS) also bases its selection on measurement data of characteristics of the relay links (GCFN/GCRN) included in the communication paths (DCMRN, FBS, LE or ICMRN, RS, GCFN/GCRN, FBS, LE).

18 Claims, 6 Drawing Sheets

Ex. 1007
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

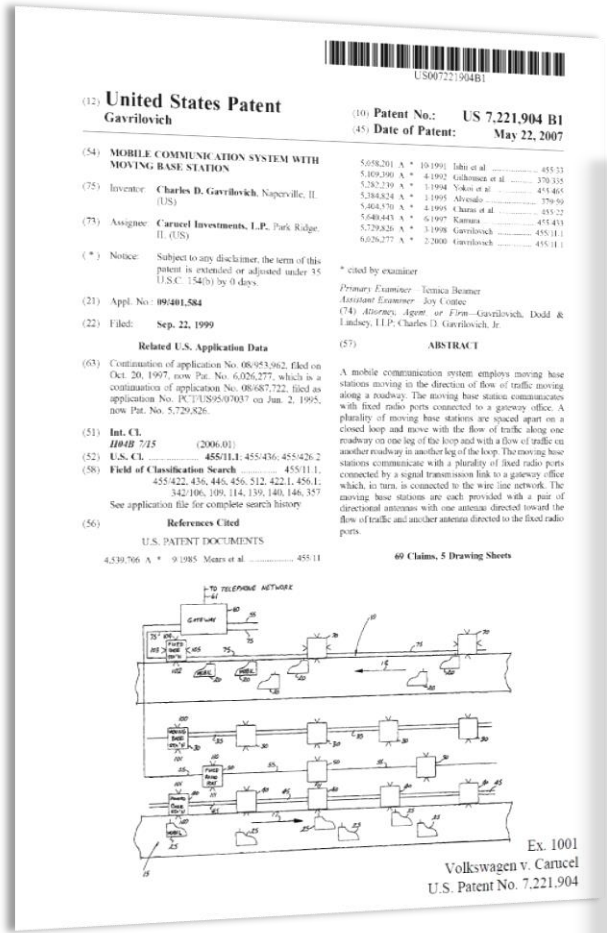
The fixed base station **FBS1** then implements the last two steps of the hand-over protocol, i.e. making and executing the hand-over decision. Both the execution step and the decision step, based on the above constructed communication tree, have to be adapted to the characteristics of the present mobile communication network MCN and optimized to yield fast and reliable hand-overs.

Ex. 1007, 11:1-7.

Therefore the decision step consists in selecting, on the basis of data included in the received communication tree, an active set including the optimal communication path, for instance based on a minimal overall Bit Error Rate BER, and a redundant set of communication paths, including the most likely candidates for future hand-overs. In the present example the active set comprises the communication path including the relay station **RS1** and the fixed base station **FBS1** whereas the redundant set comprises the actual communication path including the relay station **RS2** and the fixed base station **FBS1**.

Ex. 1007, 11:21-31.

Ground 2: *Vercauteren with Forssen*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)
(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2
(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1, 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

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5,109,390 A * 4/1992 Gilhousen et al. 370/335
5,287,239 A * 1/1994 Yokoi et al. 455/465
5,384,824 A * 1/1995 Alvesalo 379/59
5,404,570 A * 4/1995 Charas et al. 455/27
5,640,443 A * 6/1997 Kamura 455/433
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

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Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenas directed toward the flow of traffic and another antenas directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 34

34. An apparatus adapted to move in accordance with a movement of a plurality of mobile units moving relative to a plurality of fixed radio ports at a velocity greater than a relative velocity of movement between each of the mobile units of the plurality of mobile units, the apparatus comprising:

. . .

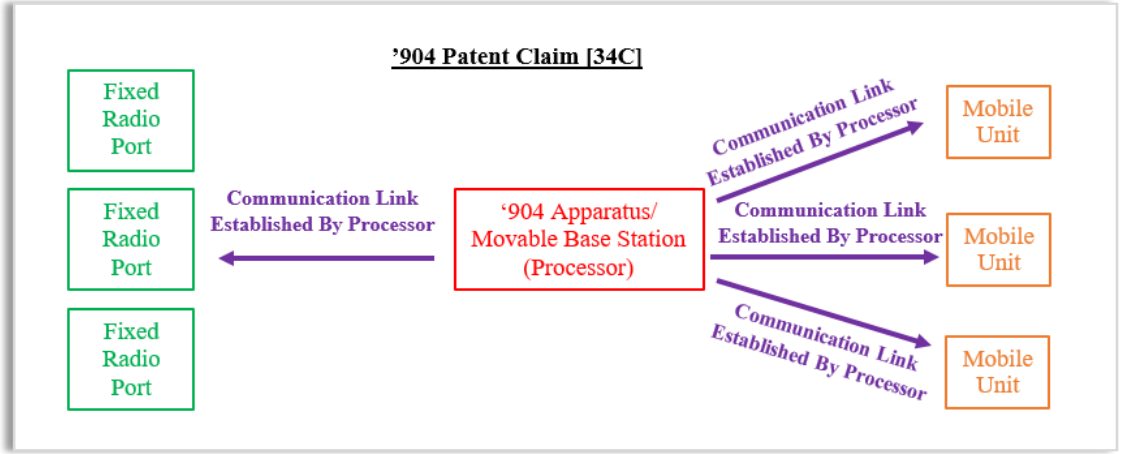
a processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports based on a plurality of signal quality indicators, each of the signal quality indicators corresponding to each of a plurality of transmitted signals transmitted from the plurality of fixed radio ports.

Ex. 1001, Claim 34.

Ground 2: Claim 34 – "Processor adapted to establish a communication link"

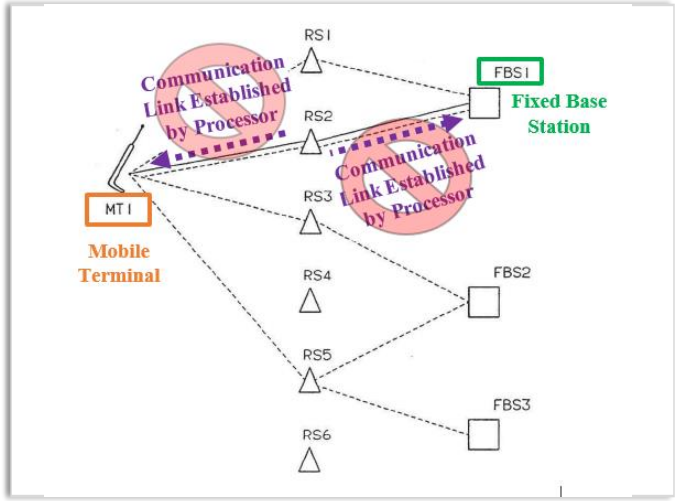
- *Vercauteren* and *Forssen* do not disclose or render obvious any moving base station that comprises a "processor adapted to establish a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports."
- First, *Vercauteren's* Roaming Relay Station (RRS) does not contain "a processor":

Independent Claim 34



Lanning Decl. ¶260, Patent Owner's Demonstrative Figure 3.

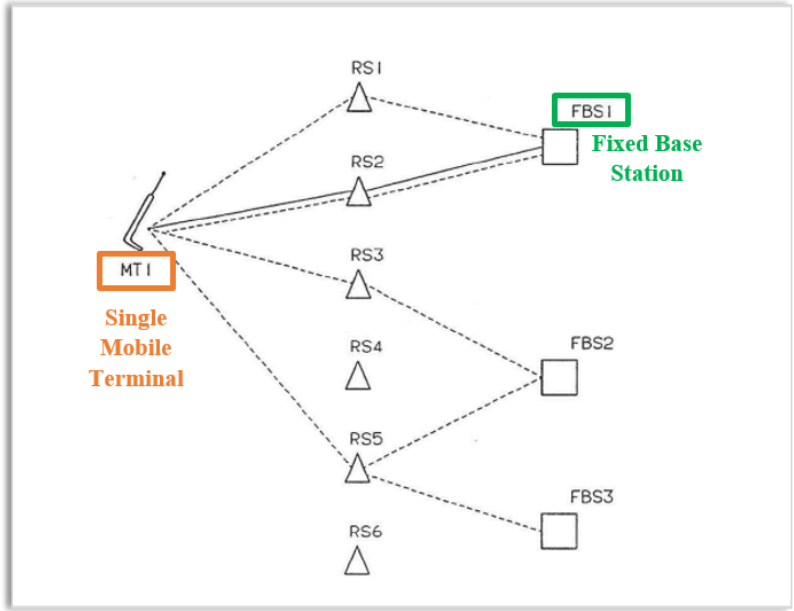
Vercauteren's disclosure



Ex. 1007, Figure 2 (annotated).

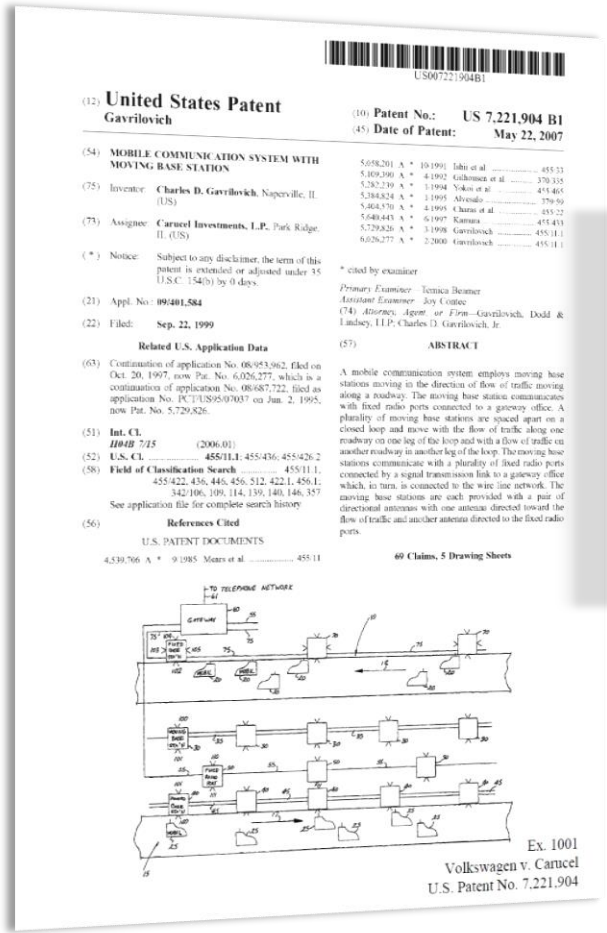
Ground 2: Claim 34 – "Processor adapted to establish a communication link"

- Second, *Vercauteren's* Figure 2 fails to disclose "a communication link between the plurality of mobile units and at least one of the plurality of fixed radio ports," as required by Claim 34.
- Instead, the communication link of Figure 2 is limited to one mobile unit (i.e., Mobile Terminal MT1):



Ex. 1007, Figure 2.

Ground 2: *Vercauteren with Forssen*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1, 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

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5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

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Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
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Dependent Claim 40

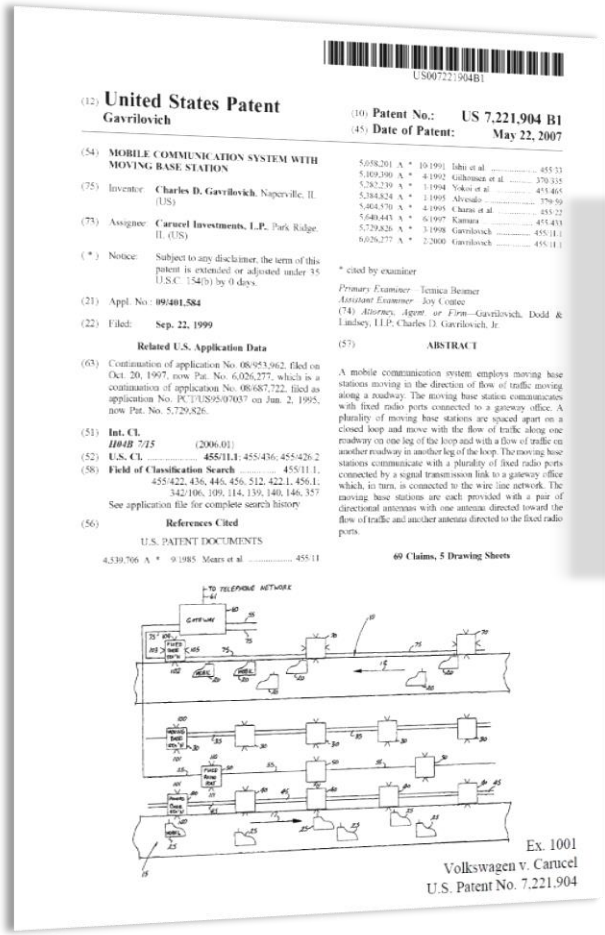
40. An apparatus in accordance with claim **34**, wherein the processor is further adapted to establish a second communication link between the plurality of mobile units and at least a second fixed radio port of the plurality of fixed radio ports based on the plurality of signal quality indicators.

Ex. 1001, Claim 40.

Ground 2: Claim 40 – "Processor adapted to establish a communication link"

- For the same reasons set forth for Claim 34 in Ground 2, *Vercauteren* and *Forssen* do not disclose or render obvious any moving base station that comprises a "processor . . . adapted to establish a second communication link between the plurality of mobile units and at least a second fixed radio port . . . ":
  - *Vercauteren's* Roaming Relay Station (RRS) does not contain "a processor."
  - *Vercauteren's* Figure 2 fails to disclose "a communication link between the plurality of mobile units and a second fixed radio port."

Ground 3: *Vercauteren* and *Forssen* with *Gilhousen390*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history

(56) **References Cited**

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6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

69 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

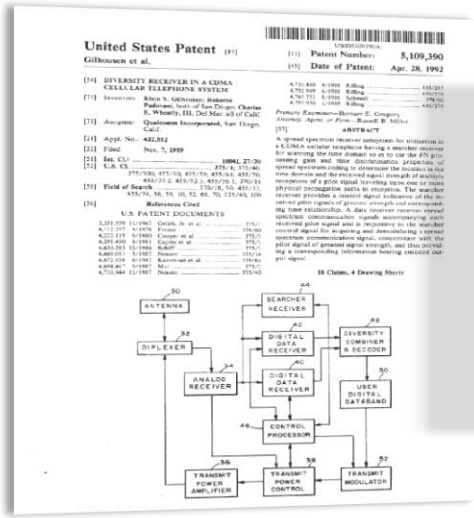
Dependent Claim 30

30. An apparatus in accordance with claim **29**, wherein the processor is further adapted to determine a plurality of best fixed radio ports and to combine a group of signals of the plurality of signals to produce the resultant signal, the group of signals transmitted from the plurality of best fixed radio ports.

Ex. 1001, Claim 30.

Ground 3: Claim 30 – "Best Fixed Radio Ports"

- *Vercauteren*, *Gilhousen390* and *Forssen* do not disclose or render obvious a "processor . . . adapted to determine a plurality of best fixed radio ports"
- Instead, *Gilhousen390* only discloses the method of "compar[ing] signal strength in the received signals":



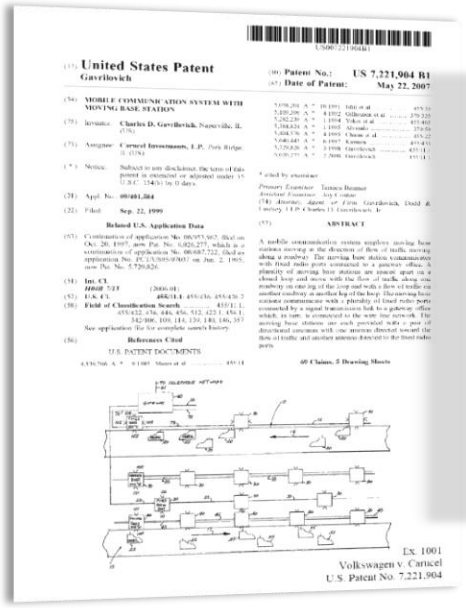
26a. The mobile unit then determines which cell it is in by comparing signal strength of pilot signals transmitted from these particular cell-sites.

Ex. 1006, 10:16-18.

- Comparing Signal strength ≠ "determin[ing] best fixed radio ports"

Ground 3: *Vercauteren* and *Forssen* with *Gilhousen390*

Dependent Claim 31

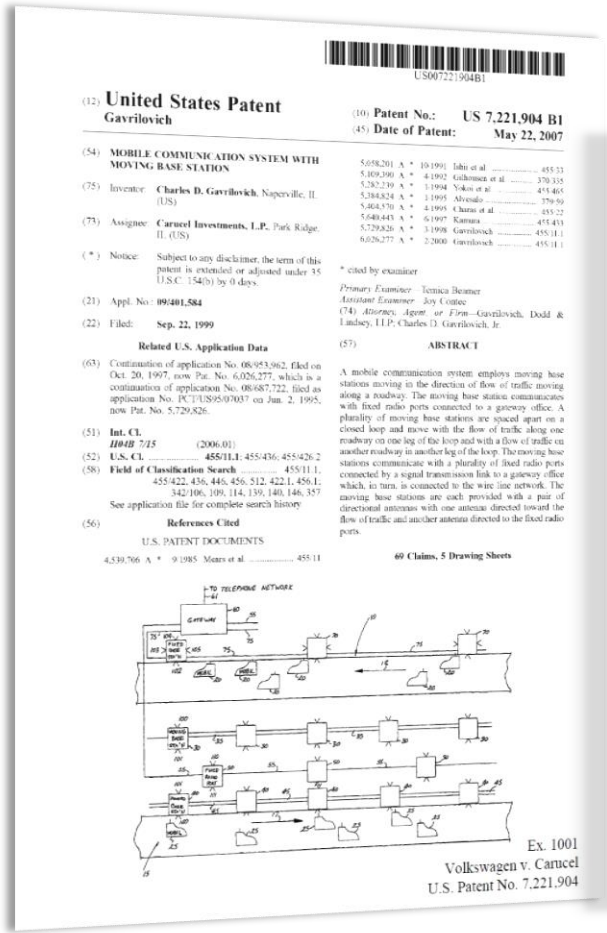


31. An apparatus in accordance with claim **30**, wherein the processor is further adapted to combine the group of signals by synchronizing the group of signals to produce a plurality of synchronized signals and combining the plurality of synchronized signals in accordance with the quality of each of the plurality of synchronized signals to produce the resultant signal.

Ex. 1001, Claim 31.

- Since the Petition fails to show that *Vercauteren* in combination with *Forssen* and *Gilhousen390* renders obvious all limitations of Claim 30, its challenges to Claim 31 fails for the same reasons.

Ground 4: *Gilhousen865*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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(21) Appl. No.: **09/401,584**

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1; 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

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5,109,390 A * 4/1992 Gilhousen et al. 370/335
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5,384,824 A * 1/1995 Alvesalo 379/59
5,404,570 A * 4/1995 Charas et al. 455/27
5,640,443 A * 6/1997 Kamura 455/433
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* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 56

56. A method of providing a communication connection between a communication network and a plurality of mobile units having a motion relative to a plurality of fixed ports, wherein the plurality of fixed ports are communicatively coupled to the communication network, the method comprising the steps of:

establishing a first communication link between the plurality of mobile units and a first fixed port of the plurality of fixed ports through a movable base station having a motion in accordance with the motion of the mobile units; and

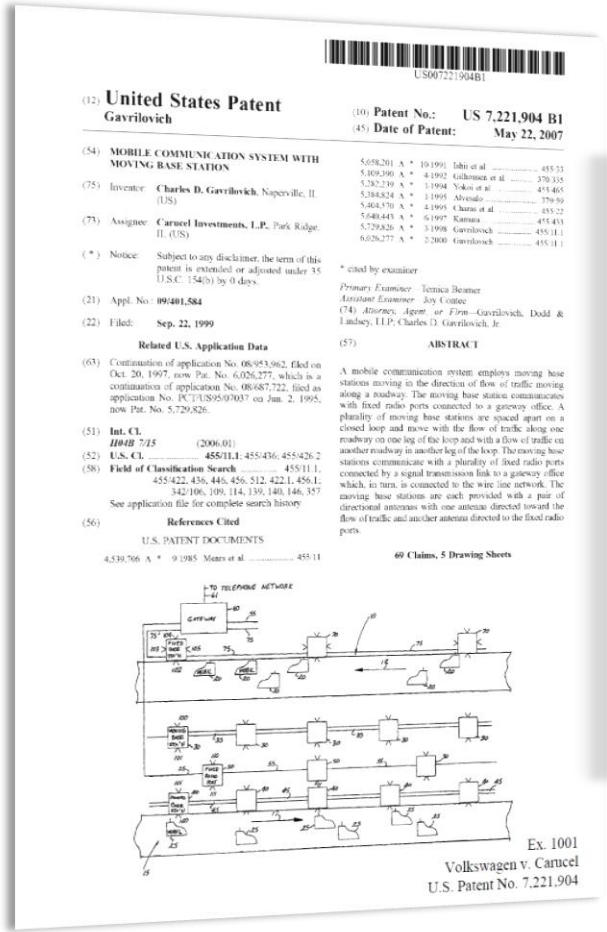
simultaneously handing off the plurality of mobile units to a second fixed port of the plurality fixed ports.

Ex. 1001, Claim 56.

Ground 4: Claim 56 – "Mobile Unit"

- For the same reasons set forth in IPR2019-01103 ('023 Patent), *Gilhousen865* does not disclose a "mobile unit" in the context of the entire '904 Patent:
  - *Gilhousen865* discloses that its radiotelephone is only able to communicate with a cellular network through the signal repeater or the alternative base station-type unit.
  - *Gilhousen865* discloses that its radiotelephone is not capable of registering with a cellular network by itself. Instead, *Gilhousen865*'s radiotelephone must rely on either the separate signal repeater or the alternative base station-type unit to perform this registration.

Ground 4: *Gilhousen865*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1, 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

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5,109,390 A * 4/1992 Gilhousen et al. 370/335
5,282,239 A * 1/1994 Yokoi et al. 455/465
5,384,824 A * 1/1995 Alvesalo 379/59
5,404,570 A * 4/1995 Charas et al. 455/27
5,640,443 A * 6/1997 Kamura 455/433
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Dependent Claim 56

56. A method of providing a communication connection between a communication network and a plurality of mobile units having a motion relative to a plurality of fixed ports, wherein the plurality of fixed ports are communicatively coupled to the communication network, the method comprising the steps of:

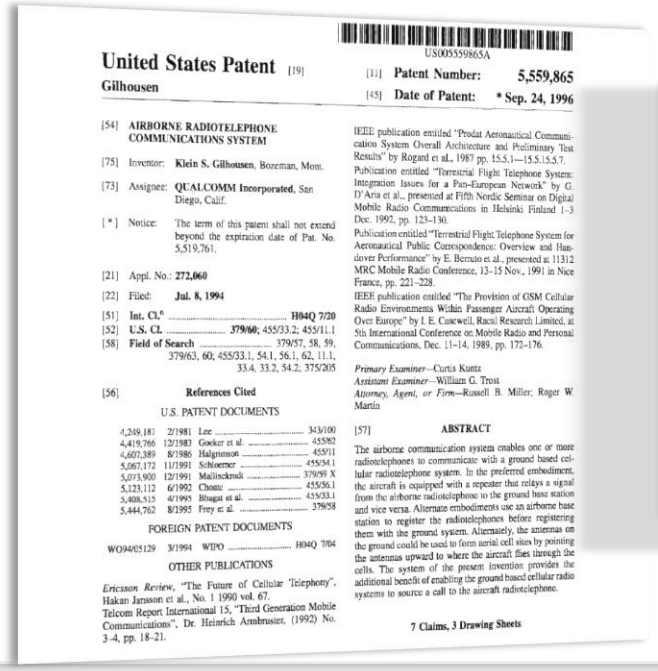
. . .

simultaneously handing off the plurality of mobile units to a second fixed port of the plurality fixed ports.

Ex. 1001, Claim 56.

Ground 4: Claim 56 – *"Simultaneously handing off"*

- *Gilhousen865* does not disclose simultaneously handing off the plurality of mobile units.
- First, *Gilhousen865* only discloses how its airborne unit determines that a handoff is required:



US005559865A

United States Patent [19]
Gilhousen

[11] **Patent Number: 5,559,865**
[45] **Date of Patent: * Sep. 24, 1996**

[54] **AIRBORNE RADIOTELEPHONE COMMUNICATIONS SYSTEM**

[75] Inventor: **Klein S. Gilhousen**, Bozeman, Mont.

[73] Assignee: **QUALCOMM Incorporated**, San Diego, Calif.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,519,761.

[21] Appl. No.: **272,060**

[22] Filed: **Jul. 8, 1994**

[51] **Int. Cl.**[6] **H04Q 7/20**
[52] **U.S. Cl.** **379/60**; 455/33.2; 455/11.1
[58] **Field of Search** 379/57, 58, 59, 379/63, 60; 455/33.1, 54.1, 56.1, 62, 11.1, 33.4, 33.2, 54.2; 375/205

[56] **References Cited**

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IEEE publication entitled "The Provision of GSM Cellular Radio Environments Within Passenger Aircraft Operating Over Europe" by I. E. Cascwell, Racal Research Limited, at 5th International Conference on Mobile Radio and Personal Communications, Dec. 11–14, 1989, pp. 172–176.

Primary Examiner—Curtis Kuntz
Assistant Examiner—William G. Trost
Attorney, Agent, or Firm—Russell B. Miller; Roger W. Martin

[57] **ABSTRACT**

The airborne communication system enables one or more radiotelephones to communicate with a ground based cellular radiotelephone system. In the preferred embodiment, the aircraft is equipped with a repeater that relays a signal from the airborne radiotelephone to the ground base station and vice versa. Alternate embodiments use an airborne base station to register the radiotelephones before registering them with the ground system. Alternately, the antennas on the ground could be used to form aerial cell sites by pointing the antennas upward to where the aircraft flies through the cells. The system of the present invention provides the additional benefit of enabling the ground based cellular radio systems to source a call to the aircraft radiotelephone.

7 Claims, 3 Drawing Sheets

the next cell and register with that base station. The determining factor on when the quality of the pilot signal has been reduced to the point that a hand-off is required is when the pilot signal drops a predetermined amount. This amount may be different for every system and is set to optimize the system performance.

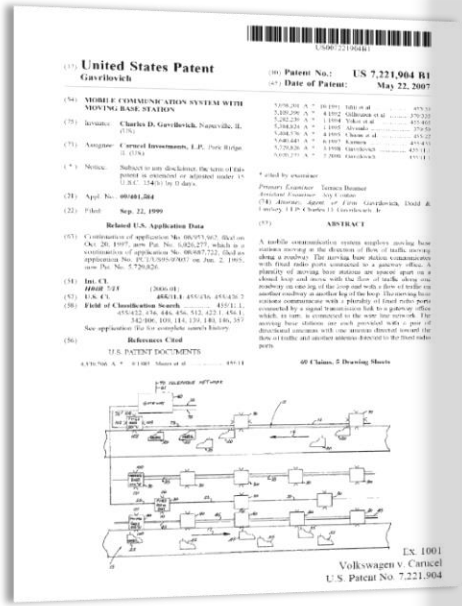
Ex. 1005, 3:59-62.

Ground 4: Claim 56 – Registration ≠ *"handing off"*

- Second, *Gilhousen865*'s disclosure of "search[ing] for the strongest pilot signal from a ground base station and register[ing] with that base station" also does not satisfy the limitation of claim 56.
  - A POSITA would understand that "registration" and a "handoff" are significantly different functions in a cellular network.
  - "Registration" is only the process by which a mobile station makes its presence known to a base station to facilitate call delivery.
  - A "handoff" occurs when the mobile unit commences communications with a new base station on the same CDMA frequency assignment before terminating its communications with the old base station.

Ground 5: *Gilhousen865 with Gilhousen390*

Dependent Claims 57, 58 and 59



57. A method in accordance with claim **56**, wherein the step of simultaneously handing off the plurality of mobile units comprises the steps of:

. . .

58. A method in accordance with claim **57**, wherein the step of combining comprises the steps of:

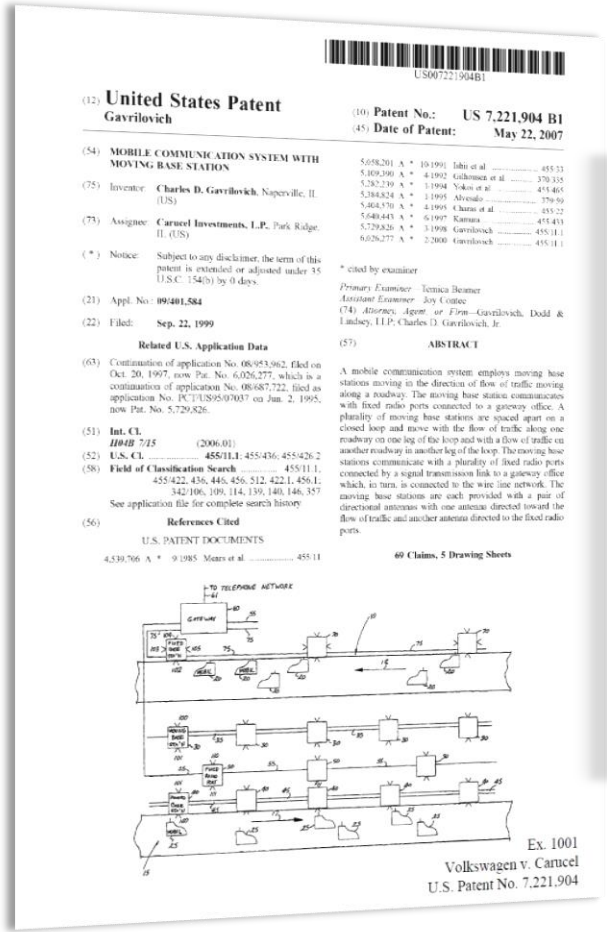
. . .

59. A method in accordance with claim **58**, wherein the step of adding comprises the step of minimizing a contribution of the first signal to the resultant signal by ignoring the first signal.

Ex. 1001, Claims 57-59.

- Since the Petition fails to show that *Gilhousen865* disclosed all limitations of Claim 56 (Ground 4), its challenges to Claims 57 – 59 fail for the same reasons, as Petitioner does not rely on *Gilhousen390* to satisfy the limitations of Claim 56.

Ground 6: *Vercauteren*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

Related U.S. Application Data

(63) Continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed as application No. PCT/US95/07037 on Jun. 2, 1995, now Pat. No. 5,729,826.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1, 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,539,706 A * 9/1985 Mears et al. 455/11

5,058,201 A * 10/1991 Ishii et al. 455/33
5,109,390 A * 4/1992 Gilhousen et al. 370/335
5,282,239 A * 1/1994 Yokoi et al. 455/465
5,384,824 A * 1/1995 Alvesalo 379/59
5,404,570 A * 4/1995 Charas et al. 455/27
5,640,443 A * 6/1997 Kamura 455/433
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 56

56. A method of providing a communication connection between a communication network and a plurality of mobile units having a motion relative to a plurality of fixed ports, wherein the plurality of fixed ports are communicatively coupled to the communication network, the method comprising the steps of:

. . .

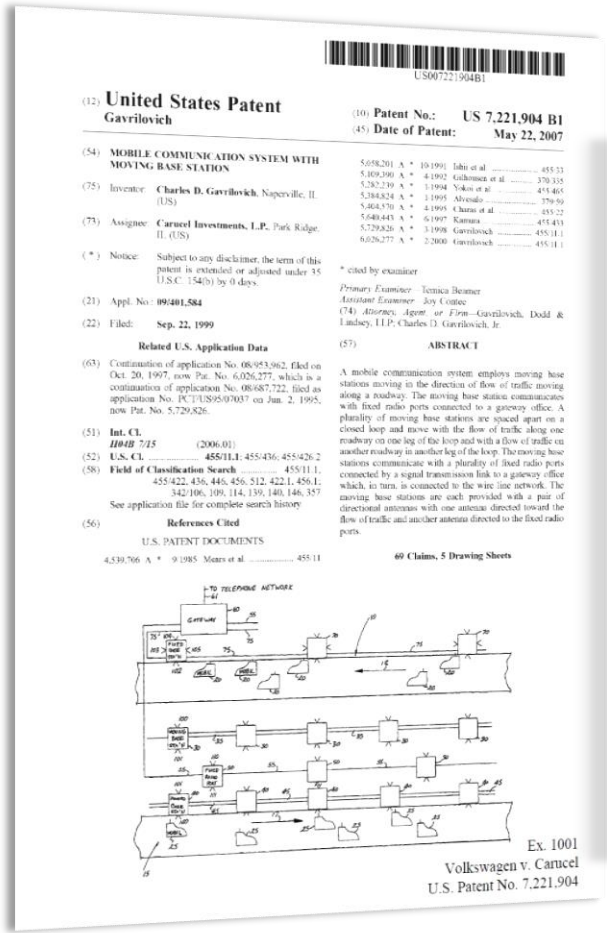
simultaneously handing off the plurality of mobile units to a second fixed port of the plurality fixed ports.

Ex. 1001, Claim 56.

Ground 6: Claim 56 – *"Simultaneously handing off"*

- *Vercauteren* does not disclose simultaneously handing off the plurality of mobile units.
- First, *Vercauteren's* Roaming Relay Station (RRS) does not "collect or organize any measurement data" or "select[]...the optimal communication path".
  - Instead, these functions are performed by the Mobile Terminal (MT) and the Fixed Base Station (FBS) as set forth in Ground 2 for Claims 22, 28, and 30.

Ground 6: *Vercauteren*



US007221904B1

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 7,221,904 B1**
(45) **Date of Patent: May 22, 2007**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(75) Inventor: **Charles D. Gavrilovich**, Naperville, IL (US)

(73) Assignee: **Carucel Investments, L.P.**, Park Ridge, IL (US)

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

(21) Appl. No.: **09/401,584**

(22) Filed: **Sep. 22, 1999**

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(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.** **455/11.1**; 455/436; 455/426.2

(58) **Field of Classification Search** 455/11.1, 455/422, 436, 446, 456, 512, 422.1, 456.1, 342/106, 109, 114, 139, 140, 146, 357
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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5,109,390 A * 4/1992 Gilhousen et al. 370/335
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5,640,443 A * 6/1997 Kamura 455/433
5,729,826 A * 3/1998 Gavrilovich 455/11.1
6,026,277 A * 2/2000 Gavrilovich 455/11.1

* cited by examiner

Primary Examiner—Temica Beamer
Assistant Examiner—Joy Contee
(74) *Attorney, Agent, or Firm*—Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

60 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
U.S. Patent No. 7,221,904

Independent Claim 56

56. A method of providing a communication connection between a communication network and a plurality of mobile units having a motion relative to a plurality of fixed ports, wherein the plurality of fixed ports are communicatively coupled to the communication network, the method comprising the steps of:

establishing a first communication link between the plurality of mobile units and a first fixed port of the plurality of fixed ports through a movable base station having a motion in accordance with the motion of the mobile units; and

. . .

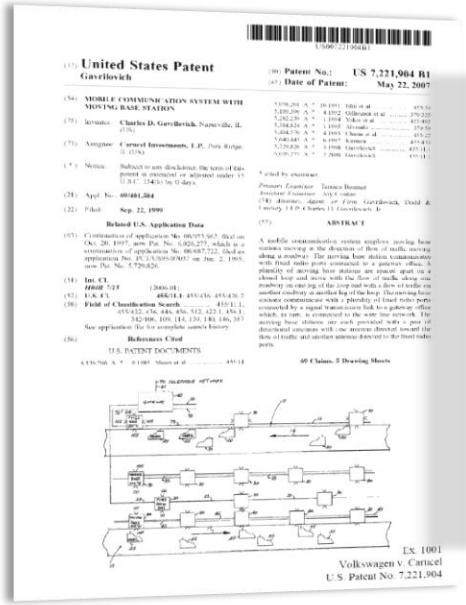
Ex. 1001, Claim 56.

Ground 6: Claim 56 –"Mobile Units"

- For the same reasons set forth in Ground 2 for Claims 22, 34, and 50, *Vercauteren* does not disclose a "mobile unit" in the context of the entire '904 Patent:
  - *Vercauteren's* Mobile Terminals do not operate on a standard cellular network or utilize standard cellular protocols for communication.
  - *Vercauteren's* Mobile Terminals are not capable of directly communicating with a fixed cellular base station.
  - *Vercauteren's* Mobile Terminals are not capable of registering with a cellular network.

Ground 7: *Vercauteren* with *Gilhousen390*

Dependent Claims 57 and 58



57. A method in accordance with claim **56**, wherein the step of simultaneously handing off the plurality of mobile units comprises the steps of:

. . .

58. A method in accordance with claim **57**, wherein the step of combining comprises the steps of:

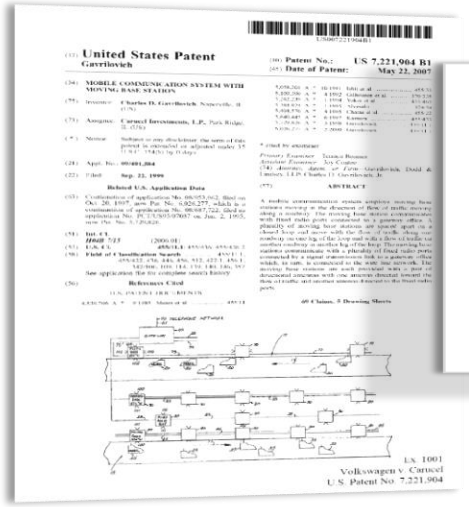
. . .

Ex. 1001, Claims 57 & 58.

- Since the Petition fails to show that *Vercauteren* discloses all limitations of Claim 56 (Ground 6), its challenges to Claims 57 – 58 fail for the same reasons, as petitioner does not rely on *Gilhousen390* to satisfy the limitations of Claim 56.

Ground 8: *Vercauteren* and *Gilhousen390* with *Forssen*

Dependent Claim 59



59. A method in accordance with claim **58**, wherein the step of adding comprises the step of minimizing a contribution of the first signal to the resultant signal by ignoring the first signal.

Ex. 1001, Claim 59.

- Since the Petition fails to show that *Vercauteren* in combination with *Gilhousen390* renders obvious all limitations of Claim 58 (Ground 7), its challenges to Claim 59 fails for the same reasons.

Volkswagen Group of America, Inc.

Petitioner

v.

Carucel Investments, L.P.

Patent Owner

Case No. IPR2019-01105

U.S. Patent No. 8,718,543

VW GoA's Patentability Challenges of the '543 Patent

Ground	References	Basis	Claims Challenged
1	Ito and Paneth	§ 103	10, 12, 19-21, 23, 26, 44, 50-53
2	Ito, Paneth, and Gilhousen390	§ 103	13, 25, 45, 55
3	Ito, Paneth, and Gardner	§ 103	18, 49

- Same primary reference as IPR2019-01102 and IPR2019-01103—*Ito*.

Primary Reasons Carucel Should Prevail

- No motivation to combine Petitioner's prior art references
  - *Ground 1*
    - A POSITA would not have been motivated to combine two disparate (*Ito* & *Paneth*) to arrive at the claimed invention of the '543 Patent.
    - Petitioner's proposed combination would result in an inoperable device.
  - *Ground 2*
    - Petitioner's proposed combination (*Ito*, *Paneth*, & *Gilhousen390*) suffers from critical capability issues.
  - *Ground 3*
    - Petitioner's secondary reference (*Gardner*) is devoid of any guidance on how its device can be used for the different types of cellular networks.

Primary Reasons Carucel Should Prevail

- Ground 1:
  - *Ito* and *Paneth* do Not Disclose "A Mobile Device" Required by Independent Claims 10, 21, 44, and 52.
- Ground 2:
  - *Ito*, *Paneth* and *Gilhousen390* Do Not Disclose "a plurality of code division multiple access (CDMA) signals" Required by Dependent Claims 13, 25, 45, and 55.
- Ground 3:
  - *Ito*, *Paneth* and *Gardner* "A Mobile Device" Required by Dependent Claims 18 and 49.

No Motivation to Combine the Prior Art References

Ground 1: *Ito* with *Paneth*

- A POSITA would not have been motivated to combine two disparate references to arrive at the claimed invention of the '543 Patent.

- Petitioner's proposed combination would result in an inoperable device.

No Motivation to Combine the Asserted Prior Art References

Ground 2: *Ito* and *Paneth* with *Gilhousen390*

- For the same reasons set forth in Ground 1, a POSITA would not have been motivated to combine *Ito* with *Paneth*:
  - A POSITA would not have been motivated to combine two disparate references to arrive at the claimed invention of the '543 Patent.
  - Petitioner's proposed combination would result in an inoperable device.
- For the same reasons set forth in IPR2019-01103 ('023 Patent), a POSITA would not have been motivated to combine *Ito* with *Gilhousen390*:
  - A POSITA would not have been motivated to modify *Ito* with *Gilhousen390* because of the critical compatibility issues that would arise when trying to implement *Gilhousen390's* CDMA functionality into *Ito's* FDMA/TDMA system.

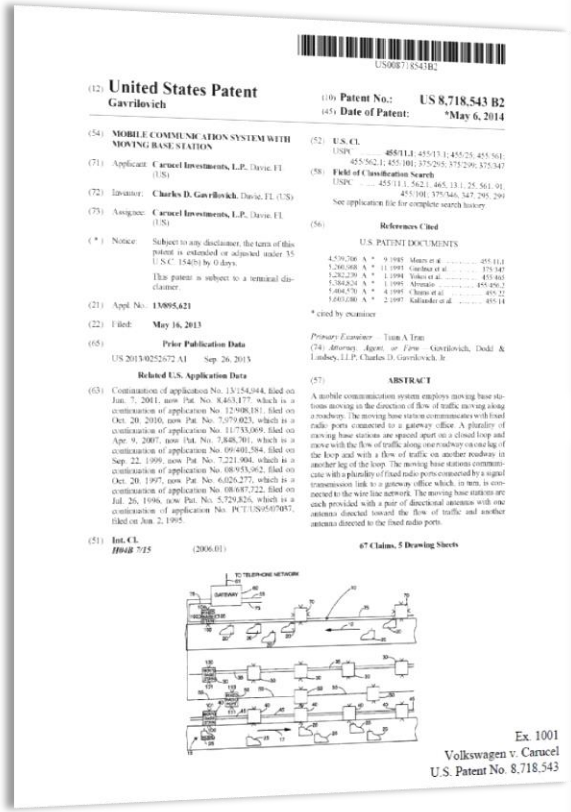
No Motivation to Combine the Asserted Prior Art References

Ground 3: *Ito* and *Paneth* with *Gardner*

- For the same reasons set forth in Ground 1, a POSITA would not have been motivated to combine *Ito* with *Paneth*:
  - a POSITA would not have been motivated to combine two disparate references to arrive at the claimed invention of the '543 Patent.
  - Petitioner's proposed combination would result in an inoperable device.
- For the same reasons set forth in IPR2019-01103 ('023 Patent), a POSITA would not have been motivated to combine *Ito* with *Gardner*:
  - Petitioner's proposed combination would result in an inoperable device.
  - Petitioner's proposed combination would also require much new circuitry not disclosed in either Ito or Gardner.

Ground 1: *Ito* with *Paneth*

Independent Claims 10, 21, 44, and 52



US008718543B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 8,718,543 B2**
(45) **Date of Patent: *May 6, 2014**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(71) Applicant: **Carucel Investments, L.P.**, Davie, FL (US)

(72) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments, L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/895,621**

(22) Filed: **May 16, 2013**

(65) **Prior Publication Data**

US 2013/0252672 A1 Sep. 26, 2013

Related U.S. Application Data

(63) Continuation of application No. 13/154,044, filed on Jun. 7, 2011, now Pat. No. 8,463,177, which is a continuation of application No. 12/908,181, filed on Oct. 20, 2010, now Pat. No. 7,979,023, which is a continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,584, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,062, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07057, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.**
USPC **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/296; 375/347

(58) **Field of Classification Search**
USPC 455/11.1, 562.1, 465, 13.1, 25, 561, 91, 455/101, 375/346, 347, 295, 299
See application file for complete search history.

(56) **References Cited**

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5,260,968 A * 11/1993 Gardner et al. 375/347
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5,384,824 A * 1/1995 Alvarado 455/456.2
5,404,570 A * 4/1995 Charas et al. 455/22
5,603,080 A * 2/1997 Kallander et al. 455/14

* cited by examiner

Primary Examiner — Tuan A Tran
(74) Attorney, Agent, or Firm — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

67 Claims, 5 Drawing Sheets

Ex. 1001
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U.S. Patent No. 8,718,543

10. An apparatus comprising:

. . .

a transmitter configured to transmit a mobile device radio frequency signal to a mobile device moving relative to Earth while the apparatus is moving relative to the plurality of base station radio interface circuits and relative to Earth, the mobile device radio frequency signal including data extracted from the cellular signals.

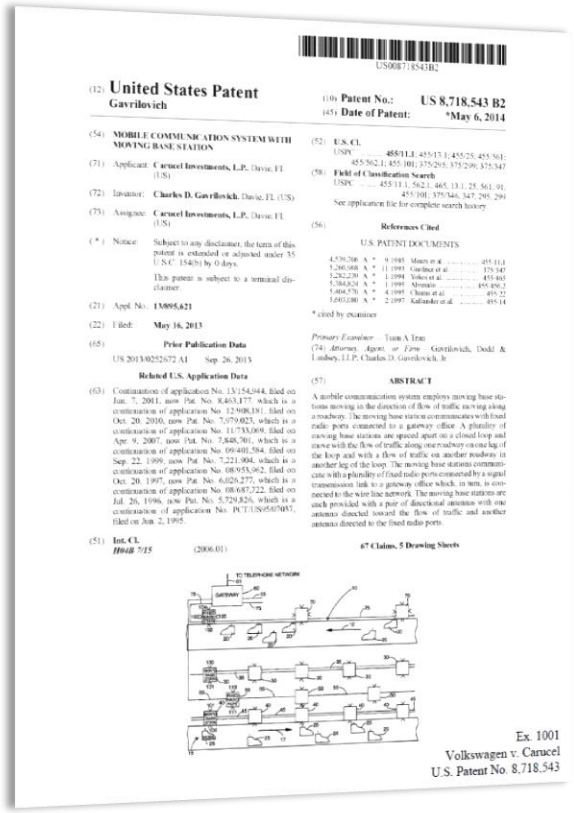
21. An apparatus comprising:

. . .

a first transmitter configured to transmit a mobile device signal to a mobile device moving relative to Earth while the apparatus is moving relative to the base station radio interface circuit and in the same direction as the mobile device, the mobile device signal including data extracted from the cellular signal;

Ex. 1001, Claims 10 & 21.

Ground 1: *Ito* with *Paneth*



US008718543B2

(12) **United States Patent**
Gavrilovich

(10) **Patent No.: US 8,718,543 B2**
(45) **Date of Patent: *May 6, 2014**

(54) **MOBILE COMMUNICATION SYSTEM WITH MOVING BASE STATION**

(71) Applicant: **Carucel Investments, L.P.**, Davie, FL (US)

(72) Inventor: **Charles D. Gavrilovich**, Davie, FL (US)

(73) Assignee: **Carucel Investments, L.P.**, Davie, FL (US)

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/895,621**

(22) Filed: **May 16, 2013**

(65) **Prior Publication Data**

US 2013/0252672 A1 Sep. 26, 2013

Related U.S. Application Data

(63) Continuation of application No. 13/154,944, filed on Jun. 7, 2011, now Pat. No. 8,463,177, which is a continuation of application No. 12/908,181, filed on Oct. 20, 2010, now Pat. No. 7,979,023, which is a continuation of application No. 11/733,069, filed on Apr. 9, 2007, now Pat. No. 7,848,701, which is a continuation of application No. 09/401,594, filed on Sep. 22, 1999, now Pat. No. 7,221,904, which is a continuation of application No. 08/953,962, filed on Oct. 20, 1997, now Pat. No. 6,026,277, which is a continuation of application No. 08/687,722, filed on Jul. 26, 1996, now Pat. No. 5,729,826, which is a continuation of application No. PCT/US95/07057, filed on Jun. 2, 1995.

(51) **Int. Cl.**
H04B 7/15 (2006.01)

(52) **U.S. Cl.**
USPC **455/11.1**; 455/13.1; 455/25; 455/561; 455/562.1; 455/101; 375/295; 375/299; 375/347

(58) **Field of Classification Search**
USPC 455/11.1, 562.1, 465, 13.1, 25, 561, 91, 455/101; 375/346, 347, 295, 299
See application file for complete search history.

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(74) *Attorney, Agent, or Firm* — Gavrilovich, Dodd & Lindsey, LLP; Charles D. Gavrilovich, Jr.

(57) **ABSTRACT**

A mobile communication system employs moving base stations moving in the direction of flow of traffic moving along a roadway. The moving base station communicates with fixed radio ports connected to a gateway office. A plurality of moving base stations are spaced apart on a closed loop and move with the flow of traffic along one roadway on one leg of the loop and with a flow of traffic on another roadway in another leg of the loop. The moving base stations communicate with a plurality of fixed radio ports connected by a signal transmission link to a gateway office which, in turn, is connected to the wire line network. The moving base stations are each provided with a pair of directional antennas with one antenna directed toward the flow of traffic and another antenna directed to the fixed radio ports.

67 Claims, 5 Drawing Sheets

Ex. 1001
Volkswagen v. Carucel
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44. An apparatus comprising:

. . .

a transmitter configured to transmit a mobile device radio frequency signal including data extracted from the plurality of cellular signals, the transmitter configured to transmit the mobile device radio frequency signal to a mobile device moving relative to Earth while the apparatus is on a vehicle moving relative to the plurality of base station radio interface circuits and relative to Earth.

52. An apparatus comprising:

. . .

a first transmitter configured to transmit a mobile device signal including data extracted from the cellular signal, the first transmitter configured to transmit the mobile device signal to a mobile device moving relative to Earth while the apparatus is on a vehicle moving relative to the base station radio interface circuit and in the same direction that the mobile device is moving;

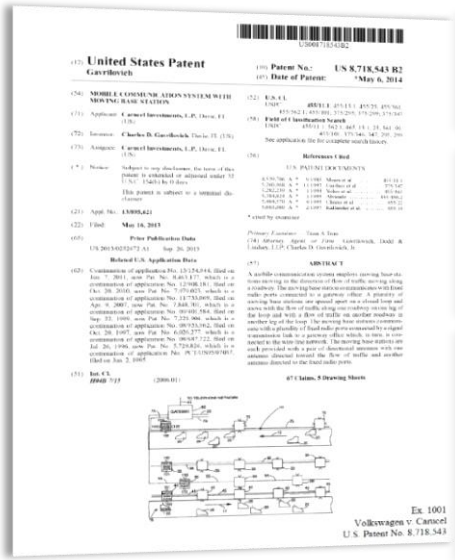
Ex. 1001,
Claims 44 & 52.

Ground 1: Claims 10, 21, 44, and 52 – "Mobile Device"

- *Ito* and *Paneth* do not disclose or render obvious a "mobile unit" in the context of the entire '543 Patent:
  - *Ito* does not disclose That its portable device is capable of directly communicating with a fixed cellular base station for the same reasons set forth in IPR2019-01103 ('023 Patent).
  - *Ito* does not disclose That its portable device is capable of capable of registering with a cellular network for the same reasons set forth in IPR2019-01103 ('023 Patent).

Ground 1: *Ito* with *Paneth*

Dependent Claims 12, 20, 23, 51 and 53



12. An apparatus in accordance with claim **10**, wherein each cellular signal includes the data.

20. An apparatus in accordance with claim **10**, wherein the transmitter is configured to transmit the mobile device radio frequency signal while the apparatus is moving in the same direction that the mobile device is moving.

23. An apparatus in accordance with claim **21**, wherein the second transmitter is further configured to transmit the another cellular signal at a cellular transmission power level higher than a mobile device transmission power level at which the another mobile device signal is transmitted.

51. An apparatus in accordance with claim **44**, wherein the transmitter is configured to transmit the mobile device radio frequency signal while the apparatus is moving in the same direction that the mobile device is moving.

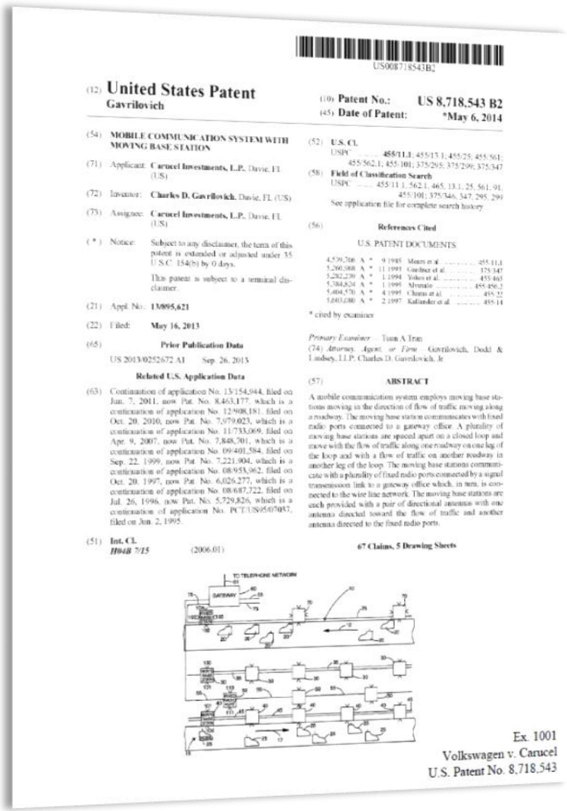
53. An apparatus in accordance with claim **52**, wherein the second transmitter is further configured to transmit the another cellular signal at a cellular transmission power level higher than a mobile device transmission power level at which the another mobile device signal is transmitted.

Ex. 1001, Claims 12, 20, 23, 51, and 53.

- Since the Petition fails to show that *Ito* in combination with *Paneth* renders obvious all limitations of Claims 10, 21, 44, and 52, its challenges to Claims 12, 20, 23, 51 and 53 fail for the same reasons.

Ground 2: *Ito* and *Paneth* with *Gilhousen390*

Dependent Claims 13, 25, 45, and 55


United States Patent
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13. An apparatus in accordance with claim **10**, wherein the plurality of cellular signals is a plurality of code division multiple access (CDMA) signals.

25. An apparatus in accordance with claim **21**, wherein the cellular signal is a code division multiple access (CDMA) signal.

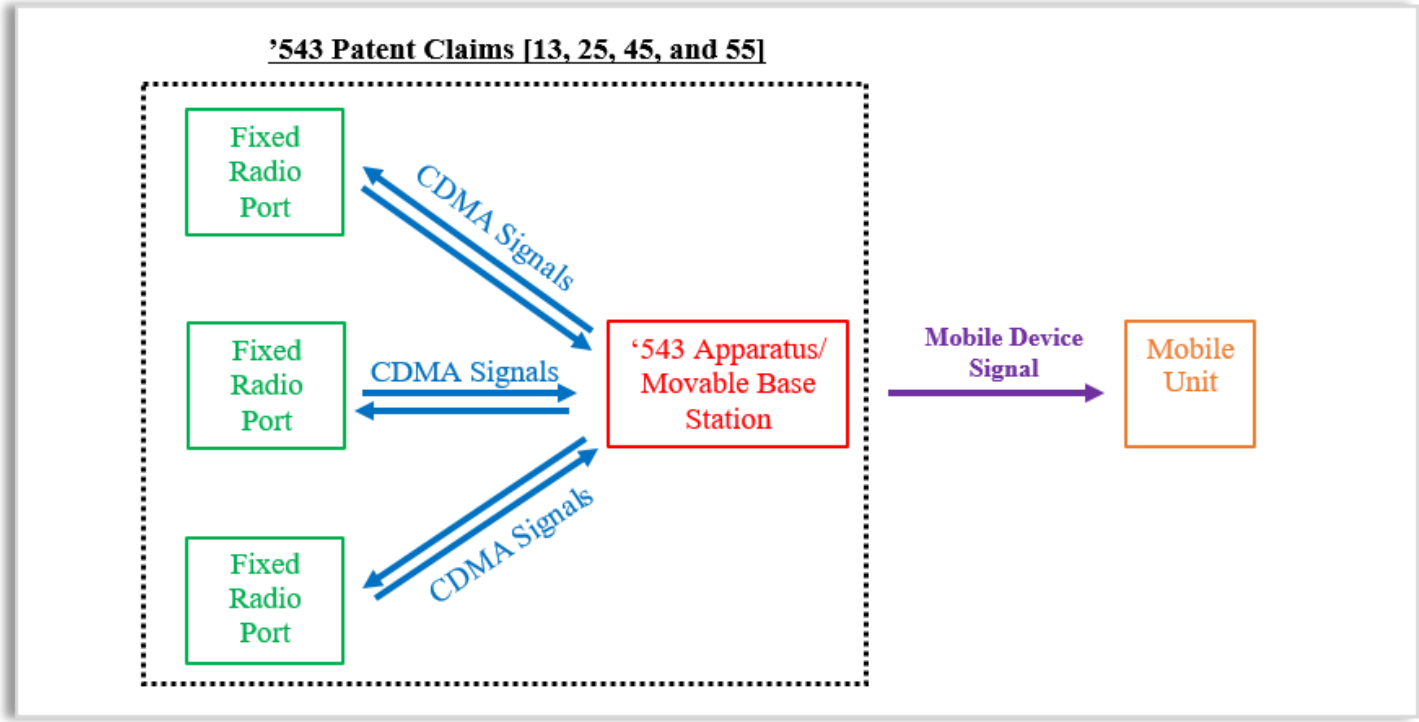
45. An apparatus in accordance with claim **44**, wherein the plurality of cellular signals is a plurality of code division multiple access (CDMA) signals.

55. An apparatus in accordance with claim **52**, wherein the cellular signal is a code division multiple access (CDMA) signal.

Ex. 1001, Claims 13, 25, 45 and 55.

Ground 2: Claims 13, 25, 45, and 55 – "CDMA Signals"

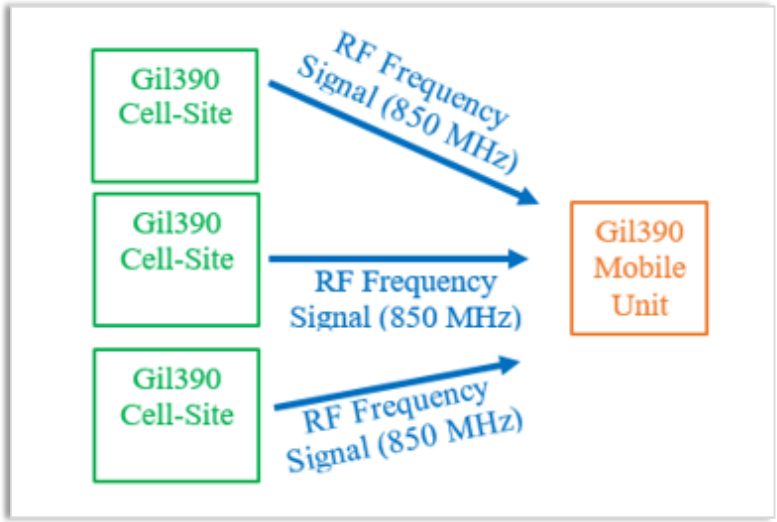
- Dependent Claims 13, 25, 45, and 55 require the plurality of cellular signals from the fixed radio ports to the moving base station to be <u>a plurality of code division multiple access (CDMA) signals</u>:



Lanning Decl. ¶174,
Patent Owner's Demonstrative Figure 1.

Ground 2: Claims 13, 25, 45, and 55 – "CDMA Signals"

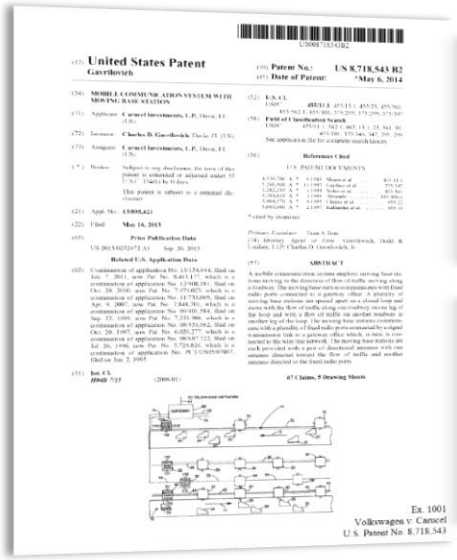
- *Ito, Paneth* and *Gilhousen390* do not disclose or render obvious any moving base station that comprises either a receiver to receive CDMA signals transmitted from a fixed base station or a transmitter to transmit CDMA signals to be received by a fixed base station
- Instead, *Gilhousen390* discloses that its cell-sites (fixed base stations) transmit CDMA signals directly to a mobile unit:



Lanning Decl. ¶175, Patent Owner's Demonstrative Figure 2.

Ground 3: *Ito* and *Paneth* with *Gardner*

Dependent Claims 18 and 49



18. An apparatus in accordance with claim **10**, further comprising a controller configured to align and combine the plurality of cellular signals.

49. An apparatus in accordance with claim **44**, further comprising a controller configured to align and combine the plurality of cellular signals.

Ex. 1001, Claims 18 and 49.

- Since the Petition fails to show that *Ito* in combination with *Paneth* renders obvious all limitations of Claims 10 and 44 (Ground 1), its challenges to Claim 18 and 49 fails for the same reasons, as Petitioner does not rely on *Gardner* to satisfy the limitations of Claims 10 and 44.

End of Demonstrative Presentation