UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ITRON, INC.,
Petitioner

v.

SMART METER TECHNOLOGIES, INC.,
Patent Owner

Case: IPR2017-01199
U.S. Patent No. 7,058,524

PETITION FOR *INTER PARTES* REVIEW UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104

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LIST OF EXHIBITS

Exhibit	Short Name	Description
ITR524-1001	’524 Patent	U.S. Patent No. 7,058,524
ITR524-1002	’524 File History	File History of U.S. Patent No. 7,058,524
ITR524-1003	Akl Declaration	Declaration of Dr. Robert Akl, D.Sc. under 37 C.F.R. § 1.68
ITR524-1004	Akl CV	*Curriculum Vitae* of Dr. Robert Akl, D.Sc.
ITR524-1005		*Reserved*
ITR524-1006	Suh	U.S. Patent Publication No. 2002/0161536
ITR524-1007	Bartone	U.S. Patent No. 6,633,823
ITR524-1008	Villicana	U.S. Patent No. 7,747,534
ITR524-1009	IPv4 Spec.	RFC 791, *Internet Protocol: DARPA Internet Program Protocol Specification*, Internet Engineering Task Force (1981)
ITR524-1010	HomePlug Spec.	HomePlug Protocol Specification v1.0.1 (December 2001)
ITR524-1011	Webster	Excerpts of Webster’s 10th New Collegiate Dictionary (1993).
ITR524-1012	Complaint	Complaint for Patent Infringement, *Smart Meter Technologies, Inc. v. Duke Energy Corp.*, Case No. 1:16-cv-00208, ECF No. 1 (D. Del.)
ITR524-1013	Roos	U.S. Patent No. 5,699,276

Exhibit	Short Name	Description
ITR524-1014	Delsing	Delsing, Jerker et al., *The IP-Meter, Design Concept and Example Implementation of an Internet Enabled Power Line Quality Meter*, *Proc. IEEE IMTC*, pp. 657-660, IEEE Instrumentation & Measurement Society (2000).
ITR524-1015	Wilkinson	Wilkinson, Dennis, *Home Scoping with X-10*, CIRCUIT CELLAR, Issue 122 (Sept. 2000).
ITR524-1016	ADE7756	Datasheet for ADE7756 by Analog Devices (2001)
ITR524-1017	Kuhn	M. Kuhn and A. Wittneben, "PLC enhanced wireless access networks: A link level capacity consideration," in *Proc. IEEE Veh. Technol. Conf.-Spring*, Birmingham, AL, May 2002, pp. 125-129.

I. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Parties in Interest

The real parties in interest for Petitioner are (1) Itron, Inc. and (2) Duke Energy Corp.

B. Related Matters

U.S. Patent No. 7,058,524 ("'524 Patent") is at issue in *Smart Meter Technologies, Inc. v. Duke Energy Corp.*, Case No. 1:16-cv-00208 (D. Del.). ITR524-1012.

C. Designation of Counsel

Lead counsel is Kirk T. Bradley (Reg. No. 46,571) and backup counsel is Christopher Douglas (Reg. No. 56,950), each of Alston & Bird LLP, 101 S. Tryon Street, Suite 4000, Charlotte, NC 28280, Tel: 704.444.1030, Fax: 704.444.1730. Pursuant to 37 C.F.R § 42.10(b), Powers of Attorney are being submitted with this Petition.

D. Service Information

Petitioner consents to electronic service directed to kirk.bradley@alston.com and Itron-SmartMeter@alston.com.

II. GROUNDS FOR STANDING UNDER 37 C.F.R. § 42.104(a)

Petitioner certifies that the '524 Patent is available for *inter partes* review ("IPR") and that Petitioner is not barred or estopped from requesting an IPR challenging claims 17-22 ("the Challenged Claims") on the grounds identified herein.

III. PAYMENT OF FEES

Petitioner authorizes the Patent Office to charge Deposit Account No. 16-0605 for the Petition fee set forth in 37 C.F.R. § 42.15(a), and for any additional fees.

IV. OVERVIEW OF CHALLENGES AND RELIEF REQUESTED

Pursuant to Rules 42.22(a)(1) and 42.104(b)(1)–(2), Petitioner requests cancellation of claims 17-22 in the ’524 Patent on the following grounds:

Count 1: Claims 17-22 are unpatentable under 35 U.S.C. § 103(a) over Suh.

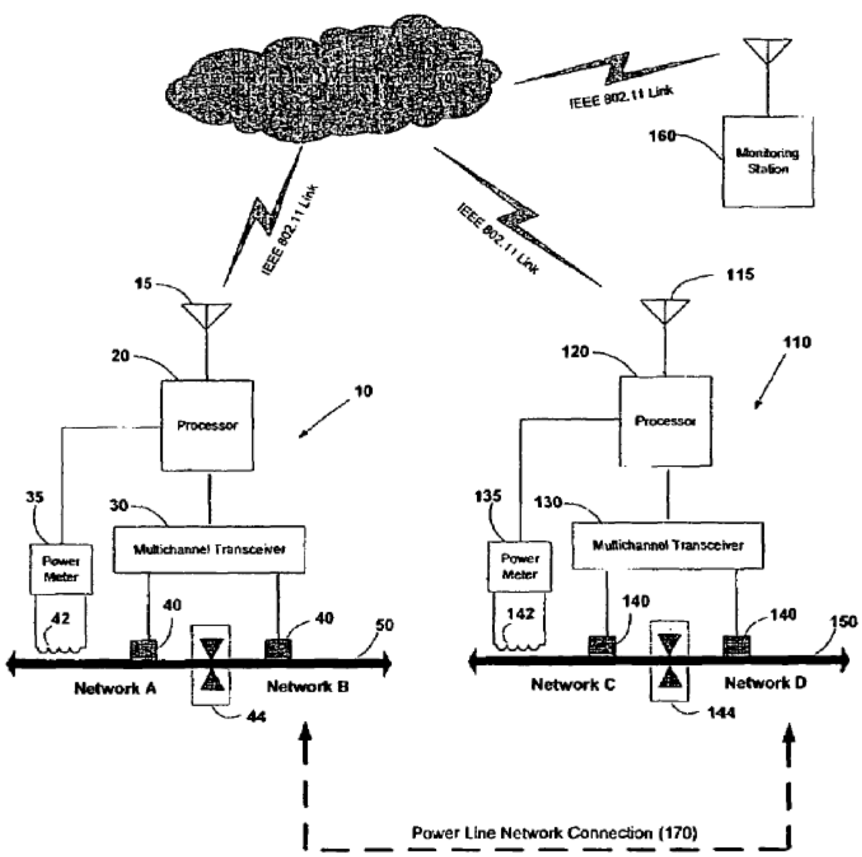
Count 2: Claims 17-22 are unpatentable under 35 U.S.C. § 103(a) over Suh in view of Bartone.

Count 3: Claims 17-22 are unpatentable under 35 U.S.C. § 103(a) over Bartone in view of Villicana.

V. INTRODUCTION

The ’524 Patent describes a basic electrical power metering system and method, where a processor is connected to a power line meter that measures the amount of power consumed. The processor can be connected to a variety of different network types, including through a conventional power line transceiver and a conventional wireless interface. Fig. 3 is representative of the system described and claimed in the ’524 Patent:

FIG. 3



ITR524-1001, Fig. 3.

Before the priority date of the ’524 Patent, power metering technology and methods of use already existed. In fact, the preferred embodiment of the ’524 Patent uses a commercially available power metering integrated circuit (“IC”), the ADE7756 by Analog Devices, which measured current fluctuations on a power line to measure power consumption. ITR524-1001, 3:29-42; ITR524-1003, ¶¶ 40-42; ITR524-1016, p. 21. Based on measured current, utilities already received power consumption information in the form of usage (kilowatt hours) and a time of usage so as to generate a bill.

The claimed networking technologies already existed and are admitted prior art. ITR524-1003, ¶¶ 71-75. The Internet Protocol was standardized in September 1981 in IETF RFC 791. ITR524-1009, p. 1; ITR524-1003, ¶ 74.

A variety of power line communications technologies existed, including HomePlug and X-10. ITR524-1001, 3:46-4:8; ITR524-1010; ITR524-1015; ITR524-1003, ¶ 73. Multiple cellular interfaces—GSM, W-CDMA, and others—also existed as of the priority date of the invention. ITR524-1003, ¶ 75.

Because each of these aspects was admitted to be known, the ’524 Patent’s alleged invention is, in reality, only the concept of transmitting the power measurement data autonomously, i.e., without external prompting. *See* ITR524-1003, ¶ 50. Specifically, independent claim 17 requires that the measured power consumption information be sent “autonomously,” such as by way of a clock, threshold, or other mechanism that does not require external prompting, in an IP-format over an external power line communications ("PLC") network. As is demonstrated below, the autonomous transmission of this data was specifically disclosed in prior art Internet-enabled power meters that form the references for counts 1, 2, and 3.

Other dependent claims add the basic concepts of automatically calculating a bill, sending the information over a wireless network, sending the data over an IP-based network (such as the Internet), and generating control signals to control or disable appliances on the basis of received power consumption information. Each of these concepts was well-developed prior to the date of invention of the '524 Patent.

VI. STATE OF THE ART

The '524 Patent made use of existing power meter technology and conventional communication protocols. For example, the "Related Art" section of the '524 Patent discusses then-existing power utility meters and power metering systems that used radio frequency for telemetry. ITR524-1001, 1:13-51 (discussed herein as admitted prior art or "APA"). Dr. Robert Akl, an expert retained by Petitioner with skill in the relevant art, states that conventional power metering systems using radio frequency ("RF") to remotely measure electrical power consumption were known in the art. ITR524-1003, ¶ 70; ITR524-1001, 1:20-24, 35-37. Dr. Akl further states: "[I]t is clear from the '524 File History and '524 APA [admitted prior art] that the method of calculating power consumption information in a utility meter processor from measured current fluctuations (e.g., a current waveform) in a power line was well known and was a commercially available implementation for electricity meters." ITR524-1003, ¶ 72.

The "Detailed Description of the Invention" section of the '524 Patent makes clear that none of the individual components or networks used in the patent were new. These elements of the admitted prior art are described in Part X.D, *infra*.

VII. PROSECUTION HISTORY OF THE '524 PATENT

During prosecution of the '524 Patent, the Examiner considered various combinations of prior art and rejected the claims as obvious. Only when the patentee added the following bolded language to the challenged independent claim did the Examiner consider the subject matter to be patentable: "transmitting the IP-based power consumption information from the processor to a destination **autonomously in IP format over an external power line network**."

The '524 File History indicates that, when determining whether the claimed subject matter was patentable, the Examiner was not provided and thus did not consider prior art that transmitted power measurement data autonomously. All three of the prior art references in this petition—Suh, Bartone, and Villicana, none of which were considered during prosecution—transmit IP-based power measurement data autonomously, without external prompting, over a power line network.

The application that resulted in the ’524 Patent was filed on October 25, 2002. ITR524-1002, p. 1. On March 2, 2004, the Examiner issued a non-final rejection, rejecting all then-pending claims (except claim 8) as anticipated by U.S. Patent No. 5,699,276 (“Roos”). ITR524-1002, pp. 57-67. Then-pending claim 20 corresponds to challenged claim 17, and at the time, read as follows:

> 20. A method of measuring power consumption information on a power line comprising:
>
> > measuring current fluctuations in the power line;
> >
> > calculating power consumption information from the current fluctuations in a processor;
> >
> > converting the power consumption information into IP-based power consumption information in the processor; and
> >
> > transmitting the IP-based power consumption information from the processor to a destination.

ITR524-1002, p. 24.

On September 3, 2004, the patentee filed a response. ITR524-1002, pp. 108-19. The patentee argued that Roos did not disclose “converting the power consumption data to IP-based power consumption information.” ITR524-1002, pp. 116-17. The patentee further argued that Roos does not explicitly teach converting the power consumption data to IP data. *Id.*

On December 2, 2004, the Examiner issued another non-final rejection. ITR524-1002, pp. 129-41. The Examiner rejected claims 1-7 and 9-31 as obvious over Roos in view of Delsing. *Id.*

The Examiner found that Roos did not teach converting power consumption data into IP-based power consumption data, but that Delsing taught this element. ITR524-1002, p. 132. The Examiner found that it would have been obvious to combine the two references. ITR524-1002, pp. 132-33.

On March 4, 2005, the patentee filed a response. ITR524-1002, pp. 146-61. The patentee argued that then-pending claims 20-26 (which correspond to issued claims 17-22) were not taught by Roos combined with Delsing because Delsing did not teach calculating power consumption information based on current fluctuations and because Roos did not teach converting power consumption information to IP-based power consumption data. ITR524-1002, p. 159. Furthermore, the patentee argued that the combination of Roos and Delsing was only a power quality meter accessible via a web page over an IP network. *Id.*

On May 18, 2005, the Examiner issued a final rejection, maintaining all prior rejection grounds and finding that the patentee's arguments were not persuasive. ITR524-1002, pp. 184-200.

On October 20, 2005, the patentee filed an amendment with a request for continued examination, in which the patentee added the following bolded language to then-pending claim 20:

> transmitting the IP-based power consumption information from the processor to a destination **autonomously in IP format over an external power line network**.

ITR524-1002, p. 210. The patentee argued that Roos did not teach communicating by *external* power line or converting the data to IP-based data. ITR524-1002, pp. 215-20. The patentee further argued that Delsing did not teach an external power line network, and that the web pages containing the power consumption data are accessed via a web browser (as opposed to direct encapsulation in IP packets that are transmitted autonomously). *Id.*; *see also* ITR524-1001, 2:32-34 ("FIG. 6 is a block diagram showing a standard Internet Protocol, Version 4 ("IPv4") packet utilized by the present invention."). The patentee also argued and explained that the term "autonomously" means "without external prompting." ITR524-1002, pp. 218-19, 221.

On January 11, 2006, the Examiner issued a notice of allowance. ITR524-1002, pp. 234-37. In the reasons for allowance, the Examiner stated that Roos does not teach or suggest "autonomously sending power consumption information over an external power line network." ITR524-1002, pp. 235-36.

The '524 Patent issued on June 6, 2006. *See* ITR524-1001, p. 1.

VIII. PRIORITY DATE OF THE ’524 PATENT

The earliest priority date for claims 17-22 of the ’524 Patent is October 25, 2002—the earliest filing date of the ’524 Patent Application. ITR524-1002, p. 1.

IX. CLAIM CONSTRUCTION

In an IPR, claim terms in an unexpired patent are interpreted according to their broadest reasonable interpretation (“BRI”) in view of the specification in which they appear. 37 C.F.R. § 42.100(b); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012). Thus, as required by the applicable rules, Petitioner’s proposed claim construction is under the BRI standard. Petitioner reserves all rights to take a different position with respect to claim construction in any other proceeding that does not rely on the BRI standard.

The term “autonomously” appears in independent claim 17, but does not appear in the ’524 Patent specification, nor does the concept of autonomous transmission appear in the specification. ITR524-1003, ¶ 66. The relevant claim element requires transmitting IP-based power consumption information from the processor to a destination “autonomously” in IP format over an external power line network.

During prosecution of the ’524 Patent, the patentee argued to the Examiner that the IP-Meter of Delsing “must be proactively accessed using a web browser to acquire data. Power quality data is not transmitted autonomously (**i.e., without**

external prompting) to a remote location over a power line network." ITR524-1002, pp. 218, 219, 221 (emphasis added).

The prosecution history therefore illustrates that the patentee considered that an "external prompting" includes an instance where a customer had to proactively request the power consumption information from the power meter in order to trigger a transmission. ITR524-1002, p. 218. This is distinct from, for example, transmissions where a power meter transmits automatically after a predetermined time interval has elapsed, or after a certain power usage threshold has been exceeded. ITR524-1003, ¶ 68.

Accordingly, based on the patentee's representations during the prosecution of the '524 Patent, the BRI of the term "autonomously" is "without external prompting." *See* ITR524-1003, ¶¶ 65-69.

X. PRIOR ART REFERENCES

The earliest priority date for claims 17-22 of the '524 Patent is October 25, 2002—the filing date of the '524 Patent application. Any published patent or patent application that claims priority to an application filed before October 25, 2002 is prior art under § 102(e). All prior art, other than admitted prior art ("APA"), cited in support of Grounds 1-3 is prior art under § 102(e).

A. U.S. Patent Application Publication No. 2002/0161536 ("Suh")

Suh is a published patent application that was published on October 31, 2002 based on U.S. Patent App. No. 09/834,346 filed on April 13, 2001, which is a continuation-in-part of U.S. Patent App. No. 09/558,391 filed on April 25, 2000. Suh was not considered during the original prosecution of the '524 Patent.

Suh is generally directed to an "internet ready electronic power meter for residential or commercial use that records the rate of electronic power usage and communicates the usage rate to a remote site permitting new business models for revenue generation." ITR524-1006, ¶ 2; *see also* ITR524-1003, ¶¶ 76-97.

B. U.S. Patent No. 6,633,823 ("Bartone")

Bartone is a U.S. Patent that issued on October 14, 2003 based on non-provisional U.S. Patent App. No. 09/906,031 filed on July 13, 2001, and provisional App. No. 60/218,094 filed on July 13, 2000. Bartone was not considered during the original prosecution of the '524 Patent.

Bartone is generally directed to a "system and method for real time monitoring and control of energy consumption at a number of facilities to allow aggregate control over the power consumption." ITR524-1007, Abstract; *see also* ITR524-1003, ¶¶ 98-109.

C. <u>U.S. Patent No. 7,747,534 ("Villicana")</u>

Villicana is a U.S. Patent that issued on June 29, 2010 based on U.S. Patent App. No. 10/254,614 filed on September 24, 2002. Villicana was not considered during the original prosecution of the '524 Patent.

Villicana is generally directed to an electrical utility meter system that "measures residential energy consumption and automatically communicates this information to a host computer via the Internet." ITR524-1008, Abstract; *see also* ITR524-1003, ¶¶ 110-22.

D. <u>'524 Patent Admitted Prior Art ("APA")</u>

The PTAB and Federal Circuit have used admissions by patentees in the specification itself as APA in determining the validity of patent claims. *See, e.g., In re NTP*, 654 F.3d 1279, 1289, 1298 (Fed. Cir. 2011).

Here, the patentee admitted in the specification that the power lines, current measurement, power measurements, power line networks, wireless networks, and internet protocol formatting claimed in claim 17 were all known in the art. For example, the '524 Patent discusses power lines, wireless 802.11 networks, and digital computers "known in the art." ITR524-1001, 2:59-63, 5:48-52, 8:16-18.

This section also describes "known" power meters (including an active energy metering IC with a serial interface, ADE7756, manufactured by Analog Devices, Inc.) and known power line transceivers (e.g., VSM6801 manufactured by Valence

Semiconductor) and protocols (including the X-10 and HomePlug protocols) for communicating over power lines using the Internet Protocol:

> In a **preferred embodiment of the present invention, power meter 35 is an ADE7756 active energy metering IC with a serial interface, manufactured by Analog Devices, Inc**. The ADE7756 incorporates two second-order, sigma-delta analog-to-digital (A/D) converters, reference circuitry, and associated signal processing circuitry to perform active power measurement from power line 50. **Real-time power consumption information, when processed by the ADE7756, is output** in the form of a serial data signal capable of being read by any serial device (e.g., an RS-232 data port). **Of course, any known power meter capable of producing a serial output signal corresponding to power consumption information can be substituted** without departing from the spirit or scope of the present invention.

ITR524-1001, 3:29-42 (emphasis added);

> Importantly, transceiver 30 allows the processor 20 of power metering system 10 to transmit and receive IP data from power line 50 using **known power line protocols such as X-10 or HomePlug**. . . . **The HomePlug protocol allows for the transmission of IP data across power lines at speeds of up to 13.75 Mbits/second**, with guaranteed Quality of Service (QoS). **The HomePlug protocol** interfaces with the Media Access Control (MAC) layer of the software, **allowing IP data to be transmitted over power lines. In a preferred embodiment of**

> **the present invention, transceiver 30 comprises a VS6801 CMOS chip manufactured by Valence Semiconductor, Inc.**

ITR524-1001, 3:52-66 (emphasis added).

The patentee further admitted to using a "standard Internet Protocol, Version 4 ("IPv4") packet," confirming that the IPv4 standard published in 1981 was known prior art. ITR524-1001, 2:32-34 ("FIG. 6 is a block diagram showing a standard Internet Protocol, Version 4 ('IPv4') packet utilized by the present invention.").

Accordingly, the '524 APA discloses known power meters that measure current fluctuations to calculate power consumption information, and transmitting data in IP format over the Internet and over power line carriers using known communications protocols (such as HomePlug and IPv4). ITR524-1003, ¶¶ 72-73. The '524 APA also discloses communicating information wirelessly (e.g., using the IEEE 802.11 protocol) over an IP-based network. ITR524-1003, ¶¶ 71, 74-75.

The '524 APA therefore discloses every element of claims 17, 19, and 20 except the element containing the purported novelty of the '524 Patent as described above—specifically, the claim element requiring **<u>autonomous</u>** transmission of power measurement information over an external power line network.

XI. <u>HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE</u>

As described herein and confirmed by the '524 APA, every aspect of the Challenged Claims was known in the art. In order to obtain an allowance, the patentee amended the claims to include the concept of transmitting the IP-based power consumption data **autonomously**. As demonstrated in each of Suh, Bartone, and Villicana, this concept was equally well known in the power metering art.

Suh teaches or renders obvious every element of all of the Challenged Claims, including specifically teaching transmitting power measurement data on an automatic and periodic basis (e.g., once per hour) to a remote location using IP packets communicated over an external power line network, as recited in independent claim 17. ITR524-1006, ¶¶ 30, 35-36, 40-42, Figs. 4-5; ITR524-1003, ¶¶ 152-156. Suh further teaches or renders obvious each of the challenged dependent claim limitations, as detailed below. *See also* ITR524-1003, ¶¶ 126-178.

Bartone also teaches that measured energy use data "can be preset to be acquired, transmitted and delivered to a central station location in user selectable time intervals, or standard increments such as 15 minute, 30 minute, 1 hour and up intervals." ITR524-1007, 10:54-57, Fig. 3; ITR524-1003, ¶¶ 198-209. Bartone further teaches or renders obvious, particularly in combination with Suh, each of the challenged dependent claim limitations, as detailed below. *See also* ITR524-1003, ¶¶ 179-237.

Villicana also teaches that power usage data can be "calculated and stored incrementally for **automatic** transmission" and provides a **daily** data upload over an IP-based power line network. ITR524-1008, 2:48-49, 7:48-62 (emphasis added);

ITR524-1003, ¶¶ 262-266. Villicana further teaches or renders obvious the challenged dependent claim limitations, particularly in combination with Bartone, as detailed below. *See also* ITR524-1003, ¶¶ 238-297.

Each of the arguments below is made from the standpoint of a person having ordinary skill in the art ("POSITA") in the field of the '524 Patent. Specifically, a POSITA at the time of the invention would have had a bachelor's degree in electrical engineering, computer science, or computer engineering, or a related field, and 2 years' experience in the field of communications systems, including experience designing, operating, and/or implementing wired and wireless networks, or equivalent. ITR524-1003, ¶ 14. Additional education might substitute for some of the experience, and substantial experience might substitute for some of the educational background. *Id.*

A. **Count 1: Claims 17-22 are unpatentable under 35 U.S.C. §103(a) over Suh**

i. Claim 17: [17 Pre] A method of measuring power consumption information on a power line comprising:

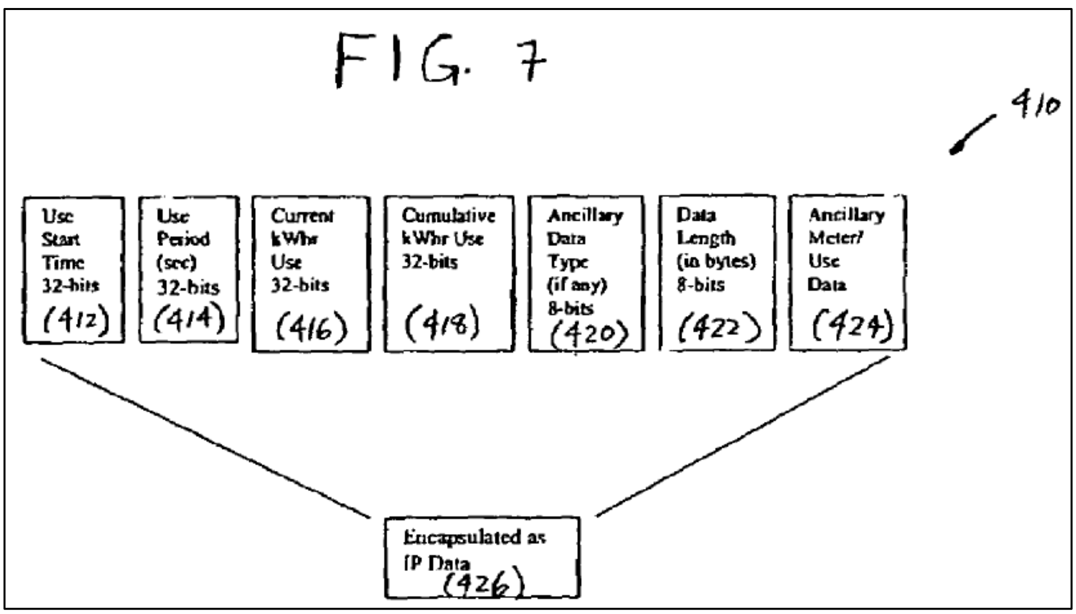
Suh discloses or renders obvious a method of measuring power consumption information on a power line. *See* ITR524-1006, ¶¶ 2, 26 ("The microprocessor 36 coordinates periodic readings of the meter chip 42 connected to the power supply 24 to generate digital representations of the voltage 44 and current 46, as schematically illustrated."); ITR524-1003, ¶ 126 ("the meter is connected to the power supply (i.e., the power line) and records the rate of electronic power usage by reading the commercially available AC meter chip, which itself measures the voltage and current on the AC power supply").

ii. Claim 17: [17A] measuring current fluctuations in the power line; [17B] calculating power consumption information from the current fluctuations in a processor;

While Petitioner does not rely on the '524 APA as an additional reference, its disclosure confirms the state of the prior art that would have been part of a POSITA's knowledge. *See* ITR524-1003, ¶¶ 70-75. The '524 APA discloses that conventional power meter chips such as the ADE7756 measure current fluctuations and calculate power consumption information based on those current fluctuations. *See* ITR524-1001, 3:17-45; ITR524-1003, ¶¶ 41-42, 71-72. The ADE7756 disclosure in the '524 APA confirms that these types of conventional power meters were known and that they pre-existed the purported invention.

In the field of electronic meters, current and voltage are measured at given time intervals and are then averaged over a time period to provide current and voltage readings. ITR524-1003, ¶¶ 40-42; ITR524-1016, p. 21. Current readings are then multiplied by voltage readings and then averaged over time to calculate energy used in terms of kilowatt hours. ITR524-1003, ¶¶ 40-42; ITR524-1016, p. 21. The '524 Patent describes the same process, namely "measuring current fluctuations in the power line," and "calculating power consumption information from the current fluctuations in a processor." ITR524-1001, 3:17-45; ITR524-1003, ¶¶ 40-42. Accordingly, the measurement of "current fluctuations" simply refers to the standard and well-known mechanism that conventional prior art power meters used to measure power consumption information, namely the measurement of rising and falling current information over time used to calculate kilowatt-hour usage. ITR524-1003, ¶¶ 40-42.

Based on the measured current, claim 17 recites calculating "power consumption" information. "Power consumption" information is discussed in the '524 Patent in reference to Fig. 7:



ITR524-1001, Fig. 7.

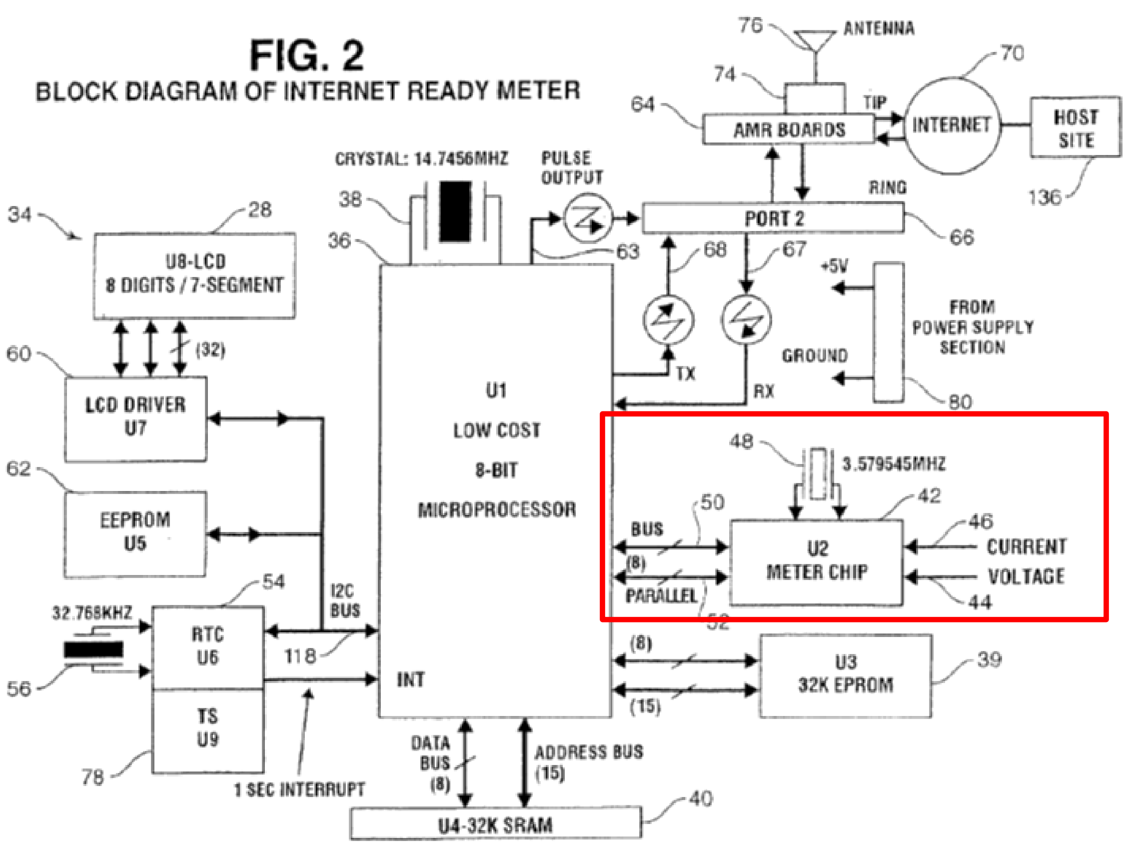
The patentee describes Fig. 7 as "a block diagram showing the data portion of a sample IP packet 410 according to the present invention for transmitting power consumption data. The power consumption data measured by the present invention is stored in a plurality of data blocks 412-424." ITR524-1001, at 9:3-7.

The '524 Patent considers a wide variety of types of information to be power consumption information. For example, data blocks 412-424, which the patentee states are examples of power consumption data, refer to the start time of energy use, the use period (in seconds), the kilowatt-hours of energy used during the use period, the kilowatt-hours of energy cumulatively used during all user periods, and others. ITR524-1001, at 9:5-22. Accordingly, power consumption information is broadly recited to include at least any of the measurements found in blocks 412-424, including at least any data regarding incremental or cumulative kilowatt-hour usage, as well as other information associated with such usage. *Id.*; ITR524-1003, ¶ 136.

The patentee also clearly understood the term "power consumption information" to mean the same thing as "power consumption data," which comports with the understanding of a POSITA since in this context "information" is a synonym for "data." *Compare* ITR524-1001, 8:66-9:2 *with* 10:54-55; *see also* ITR524-1011 ("data: factual information (as measurements or statistics) used as a basis for reasoning, discussion, or calculation").

Suh discloses or renders obvious measuring current fluctuations in the power line and calculating power consumption information from the current fluctuations in a processor. *See* ITR524-1006, ¶¶ 2, 26, 31 ("**The microprocessor 36 coordinates**

periodic readings of the meter chip 42 connected to the power supply 24 **to generate digital representations of the voltage 44 and current 46**, as schematically illustrated," and "the current temperature . . . is sampled and recorded by the microprocessor 36 concurrently with the acquisition of the time, and preferably the time and date, when reading the current **power usage data generated by the meter chip 42**.") (emphasis added); ITR524-1003, ¶¶ 126-138. For example, Fig. 2 discloses a meter chip U2 that receives current and voltage as input and provides measured current information to the microprocessor U1:



ITR524-1006, at Fig. 2 (red annotation added).

Based on the input current, the microprocessor calculates power consumption information. ITR524-1006, ¶ 26; ITR524-1003, ¶¶ 128-138. As illustrated in Fig. 5, Suh confirms that the "read energy pulses from meter chip" are used by the microprocessor to prepare at least kilowatt-hours and date/time. ITR524-1006, ¶¶ 41-43. Both of these measurements are explicitly considered to be power consumption information by the '524 Patent. ITR524-1001, at 9:5-22.

The '524 APA also confirms that measuring current fluctuations and calculating power measurement data by a processor based on those current fluctuations was well known to a POSITA. *See* ITR524-1001, 3:17-45; ITR524-1003, ¶¶ 40-42; ITR524-1016, p. 21. The '524 APA admits that a commercially available AC meter chip, ADE7756, was known, disclosing it as the preferred embodiment of the '524 Patent's power meter 35. ITR524-1001, 3:17-45. That conventional power meter performs the steps of "measuring current fluctuations in the power line" and "calculating power consumption information from the current fluctuations in a processor." ITR524-1003, ¶¶ 40-42, 71-72. The ADE7756 datasheet confirms that the device measured current and voltage as inputs and calculated power usage data. ITR524-1003, ¶ 42; ITR524-1016, p. 21.

According to Dr. Akl,

> [A] POSITA would have understood that the microprocessor 36 would use the measured current and voltage information to generate the rate

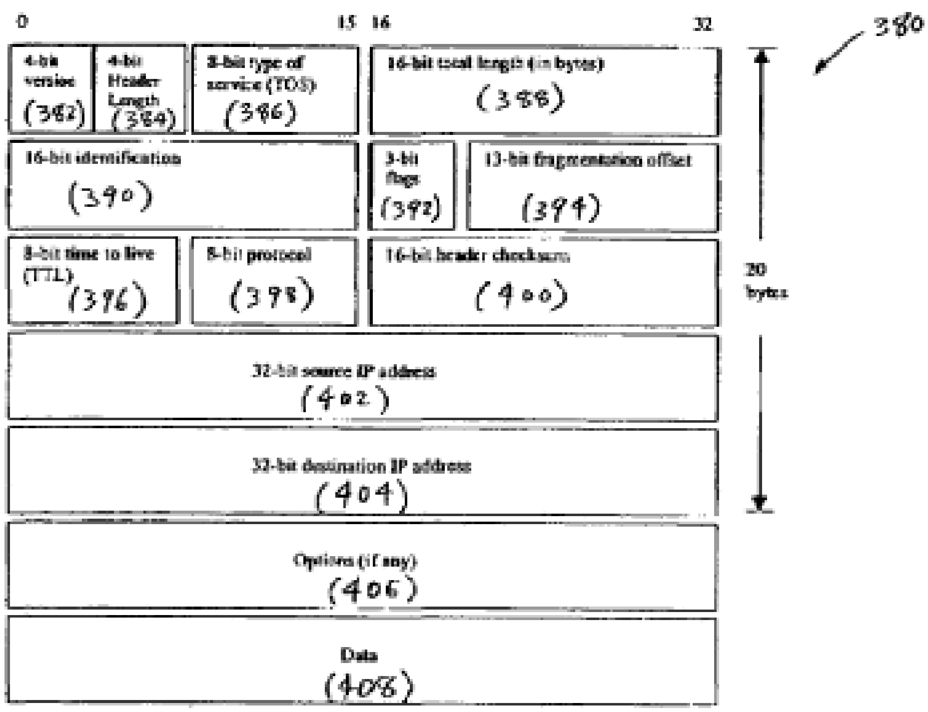
of power usage, as known in the prior art and described in the patentee's recitation of how conventional power meters operate.

ITR524-1003, ¶ 133.

iii. Claim 17: [17C] converting the power consumption information into IP-based power consumption information in the processor:

"IP-based" power consumption information is discussed in the '524 Patent in reference to Fig. 6:

FIG. 6



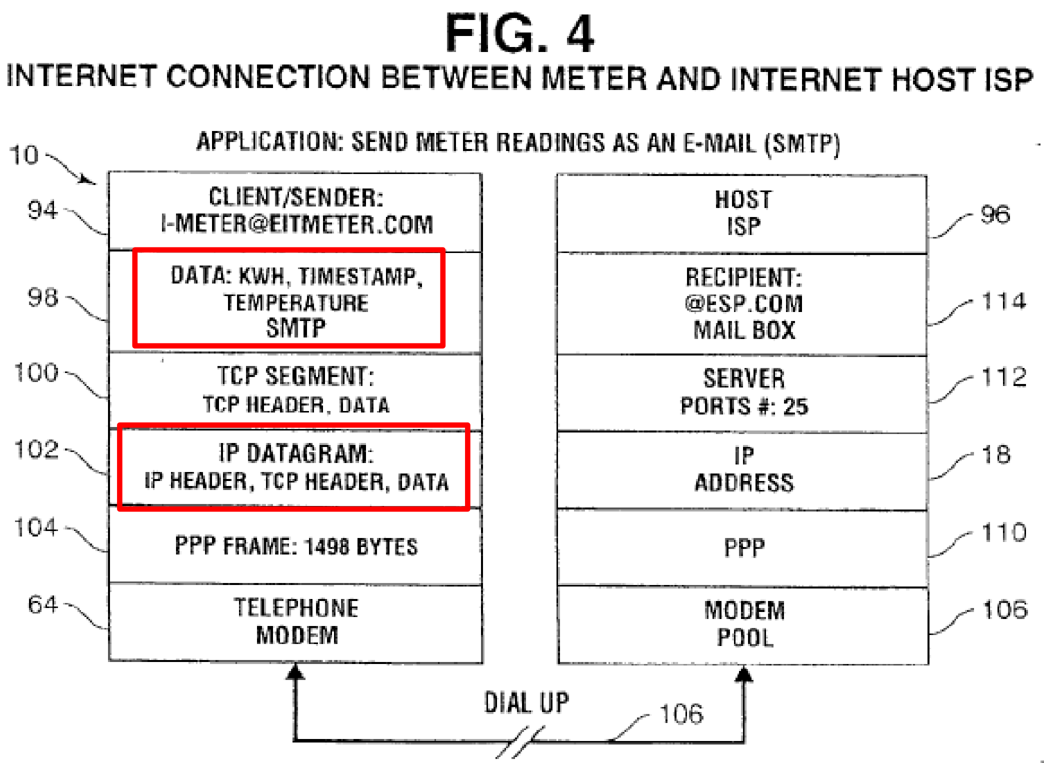
ITR524-1001, Fig. 6.

The patentee describes Fig. 6 of the '524 Patent as "a block diagram showing a standard Internet Protocol, Version 4 ('IPv4') packet utilized by the present invention." ITR524-1001, 2:32-34. The IPv4 packet contains a number of subcomponents, 380-406, that a POSITA would have recognized as comprising an Internet Protocol header. ITR524-1003, ¶ 143; ITR524-1001, 8:49-59.

The '524 Patent specification states that by storing power consumption data in the payload data block 408, the stored power consumption information is converted "into IP-based data." ITR524-1001, 8:66-9:2.

The '524 Patent's use of "IP" in the term "IP-based" refers to the Internet Protocol. ITR524-1001, 1:61 ("Internet Protocol (IP)"). The '524 Patent appears to use the term "IP-based," "encapsulated as IP data," and "in IP format" to mean the same thing. *See, e.g.*, ITR524-1001, at 8:59-61, 9:18-22, Fig. 7; ITR524-1003, ¶¶ 145-47. When the '524 Patent specification explains that the power measurement information is "IP-based," a POSITA would have understood that it is encapsulated as part of the payload data of an Internet Protocol packet. ITR524-1003, ¶¶ 145-47.

With that background, Suh discloses or renders obvious converting the power consumption information into IP-based power consumption information in the processor for the purpose of transmission. *See* ITR524-1003, ¶¶ 139-51. For example, Suh teaches:



ITR524-1006, at Fig. 4 (red annotations added); *see also id.* ¶ 35, ("In the system shown in FIG. 4, the electronic power meter 10 is the client/sender 94 of the data records including the **kilowatt hour usage rate**, ... The data records are sent as an e-mail 98 using standard international computer network protocols.") (emphasis added); *id.* ¶ 36 ("In the subsequent layer, the IP (Internet Protocol) is added to comprise the IP datagram 102 including the IP header, the TCP header and the data."). Storing information in a payload data block of an Internet Protocol packet is direct encapsulation in IP packets at the network layer. ITR524-1003, ¶ 148.

Therefore, the power usage data—for example, kilowatt-hour usage in block 98—forms the data payload encapsulated in the IP datagram prepared for transmission, thereby creating IP-based power consumption information. ITR524-1003, ¶¶ 139-51. The patentee cannot argue to the contrary because any data transmitted using TCP/IP is sent with an IP header and therefore would be stored in a payload data block, which the patentee expressly defined as a test for what constitutes "IP-based" data. ITR524-1001, 8:66-9:2; ITR524-1003, ¶ 149.

Accordingly, Suh teaches that the "microprocessor 36 converts the power consumption information (for example, the kilowatt hour usage) it receives from meter chip 42 into IP-based power consumption information by adding the IP (Internet Protocol) header to the data itself." ITR524-1003, ¶ 140.

iv. Claim 17: [17D]: transmitting the IP-based power consumption information from the processor to a destination autonomously in IP format over an external power line network

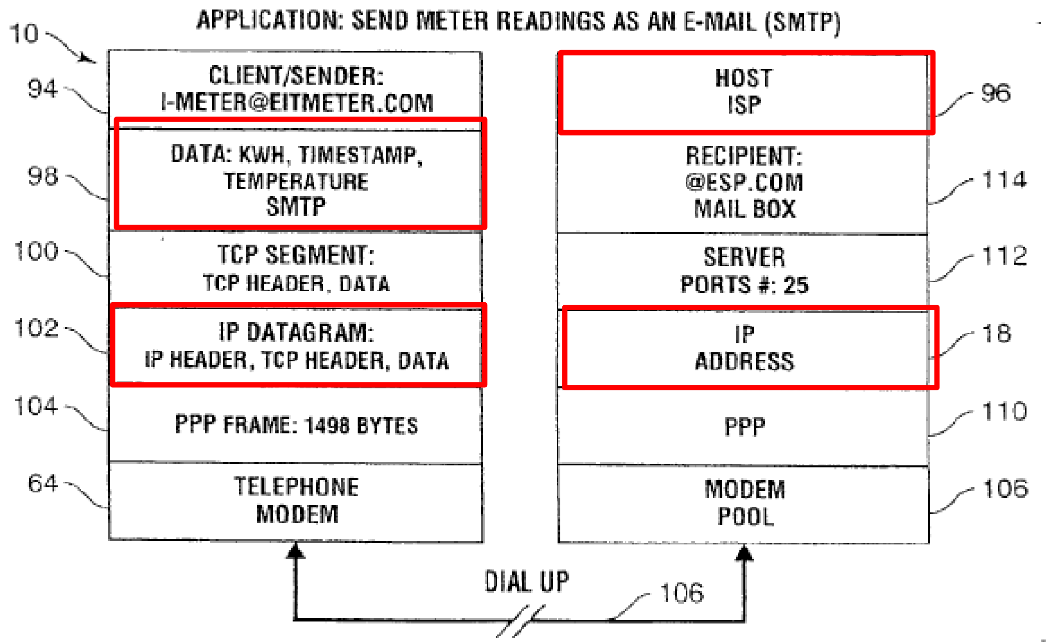
Suh discloses or renders obvious transmitting the IP-based power consumption information from the processor to a destination autonomously in IP format over an external power line network. *See* ITR524-1003, ¶¶ 152-56. For example, Suh teaches automatically sending an IP-formatted email containing kilowatt-hour usage over a power line network once per hour. *Id.*

Suh discloses the "autonomous" or independent transmission of power consumption information. Figs. 4 and 5 and the accompanying text indicate that Suh transmits power consumption data (including kilowatt-hour usage) automatically every hour to the remote destination, without external prompting. ITR524-1006,

¶¶ 40-42; ITR524-1003, ¶¶ 152-54. This email is generated by adding Internet Protocol headers to the power consumption data to form IP-based power consumption data that can be emailed or otherwise sent over the Internet. ITR524-1006, ¶¶ 40-42; ITR524-1003, ¶¶ 154-56.

FIG. 4

INTERNET CONNECTION BETWEEN METER AND INTERNET HOST ISP



ITR524-1006, at Fig. 4 (red annotations added).

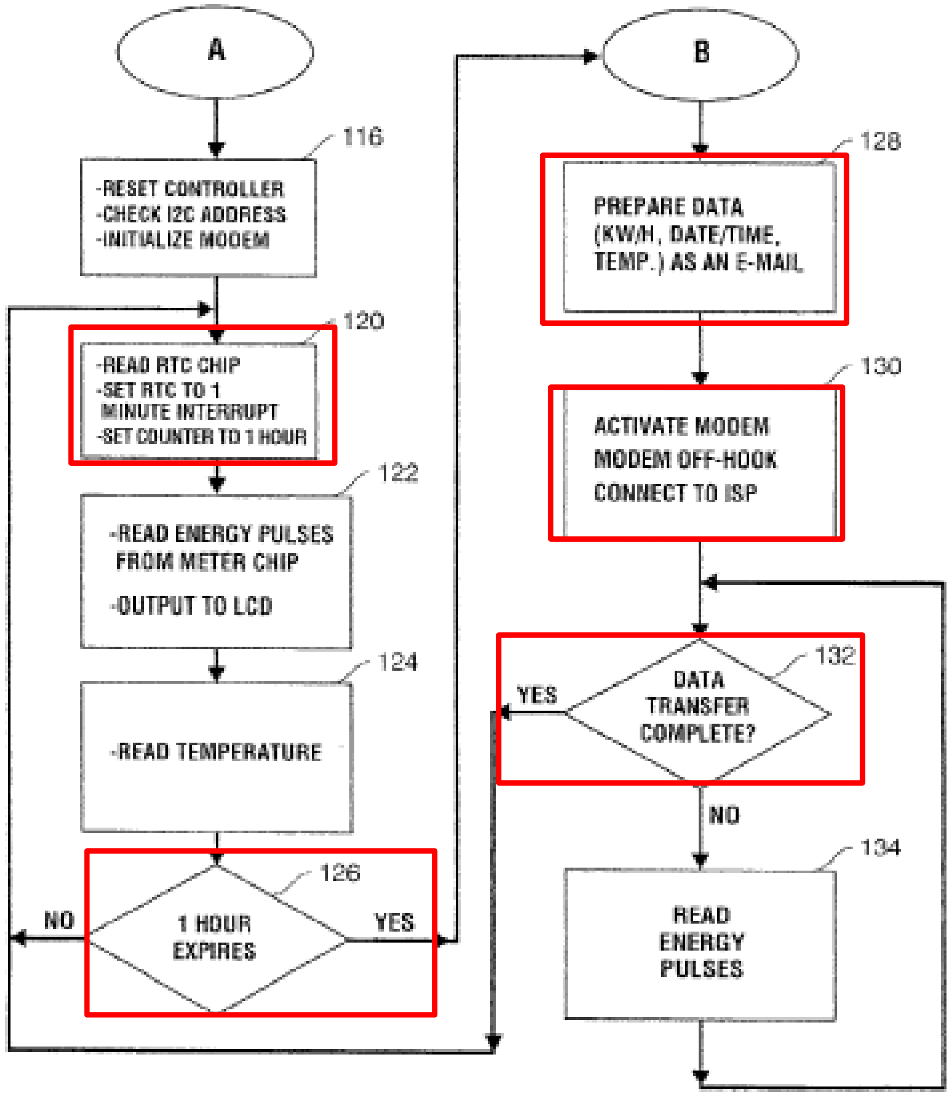


FIG. 5
METER BASIC FLOW CHART

ITR524-1006, at Fig. 5 (red annotations added); *see also id.* ¶¶ 8, 30, 42.

Suh teaches that power usage data is recorded every minute and an email containing the power usage data is sent by the power meter to the data collection center every hour autonomously, without external prompting:

> Here a one minute interrupt is programmed with the counter set to one hour. Data polling occurs each minute and processed for transmission each hour.
>
> . . . .
>
> At decision diamond 126 the counter is checked to determine if one hour has expired. . . . If yes, the collected data is prepared for messaging to the data collection center, that is the host ISP 96.

ITR524-1006, ¶¶ 40-42. These transmissions occur without external prompting because they simply rely on the power meter's internal real-time clock chip 54. ITR524-1006, ¶¶ 40-42; ITR524-1003, ¶ 153, Fig. 5.

Suh's power meter "is either line connected to the international computer network 70 via communication lines 72, **power line 73 using developed data transmission overlay technologies** or, using a transceiver 74 via airway transmissions through an antenna 76, as also shown in FIG. 1." ITR524-1006, ¶ 30 (emphasis added).

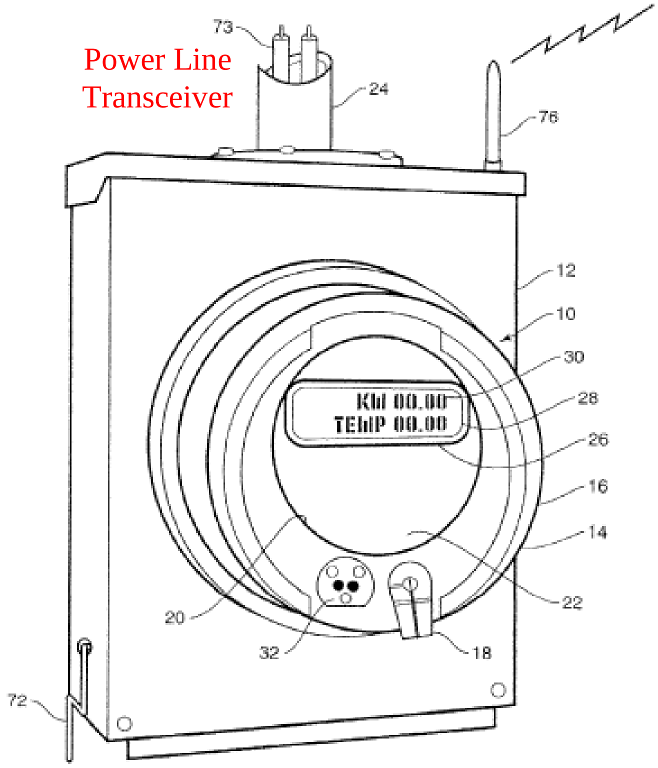


FIG. 1

ITR524-1006, at Fig. 1 (red annotation added).

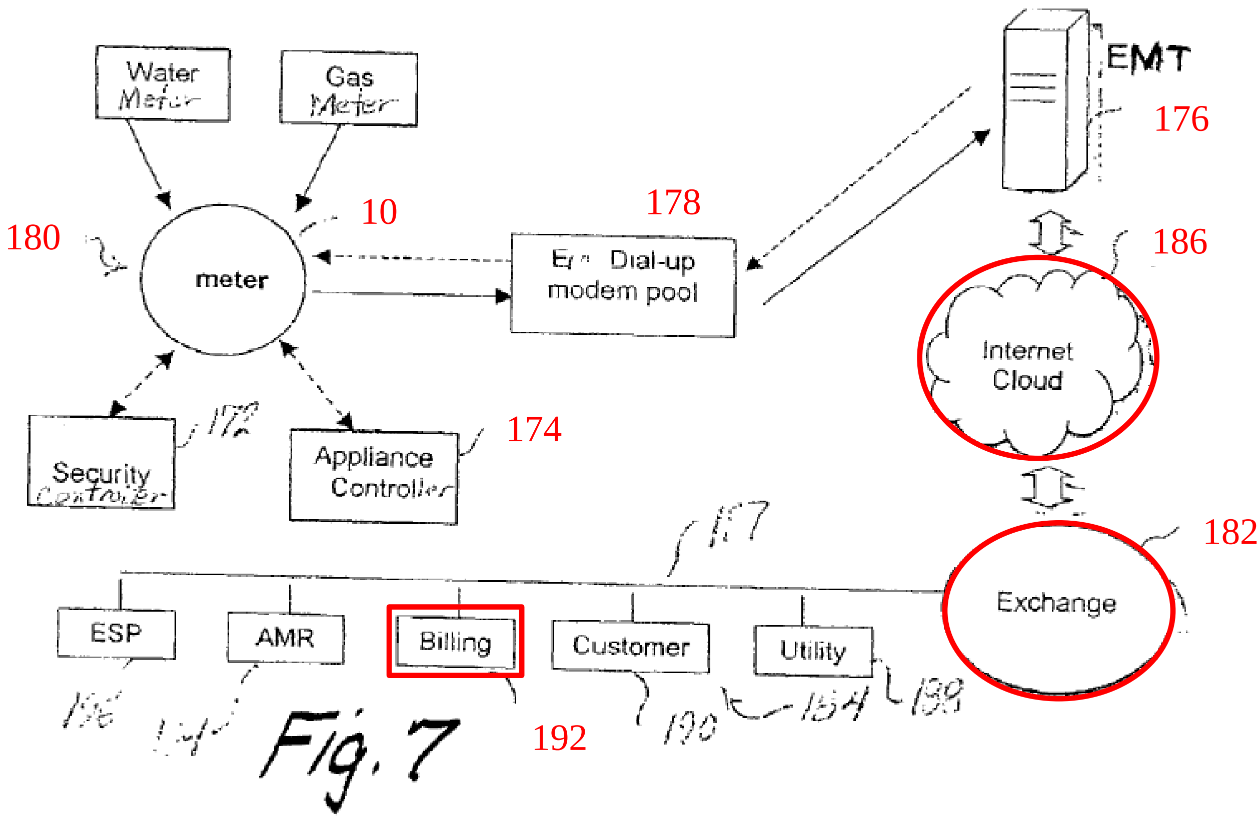
Suh further transmits the power measurement data (for example, kWh usage) in an IP datagram, i.e., in IP format, over the internet, "also known as the world wide international computer network," which a POSITA would have understood is an IP-based network. *Id.* ¶ 2, 8, 30, Fig. 4; ITR524-1003, ¶ 154.

Furthermore, the IP datagram (i.e., the IP-based power consumption information) may optionally be sent over power line communication systems to a data collection center, which would be over an external power line network. ITR524-1006, ¶¶ 30, 51; ITR524-1003, ¶ 155. Suh teaches that communications may occur with a remote host via power line communications and that any of the suggested physical network types could be used to transmit data. ITR524-1006, ¶¶ 30, 51.

Accordingly, Suh teaches transmitting IP-based power measurement information autonomously over an external power line network. *See* ITR524-1003, ¶¶ 152-56.

v. Claim 18: [18A]: The method of claim 17, further comprising: receiving the IP-based power consumption information at the destination; and calculating a utility bill using the IP-based power consumption information.

Suh discloses or renders obvious receiving the IP-based power consumption information at the destination, and calculating a utility bill using the IP-based power consumption information. *See* ITR524-1003, ¶¶ 158-61. For example:



ITR524-1006, Fig. 7 (red annotations added); *see also* ITR524-1006, ¶¶ 11, 47, 49, 54.

Suh teaches that, when power measurement data is transmitted to a remote site, "**[t]he remote site is typically the service and accounting center** of the company providing or brokering the electrical power. In this manner **the service and accounting center or service provider can monitor power usage** according to time and date of usage, **and generate** user profiles and **user billings for power usage** and respond to any events detected in the power network." ITR524-1006, ¶ 11 (emphasis added).

Furthermore, "Using the internet communication system 156 the internet ready power meter communicates with the primary service provider 159, here the energy service provider (ESP) . . . . The energy service provider 158 in turn communicates through the internet communication system to clients of the energy meter service provider 158 which may be separate or independent entities, and are, for example, . . . billing services 166." ITR524-1006, ¶ 49. In Suh's preferred embodiment, "the remote site is the information service provider in control of the electronic power meters, where customer and client billings relating to meter data are prepared." *Id*. ¶ 9.

Accordingly, the relevant passages of Suh "indicate that the power meter system of Suh contemplates transmitting the recorded power consumption data in IP format to a remote site—for example, a billing service for the utility or a service and accounting center—and then generating 'user billings for power usage' based on that power consumption data." ITR524-1003, ¶¶ 160.

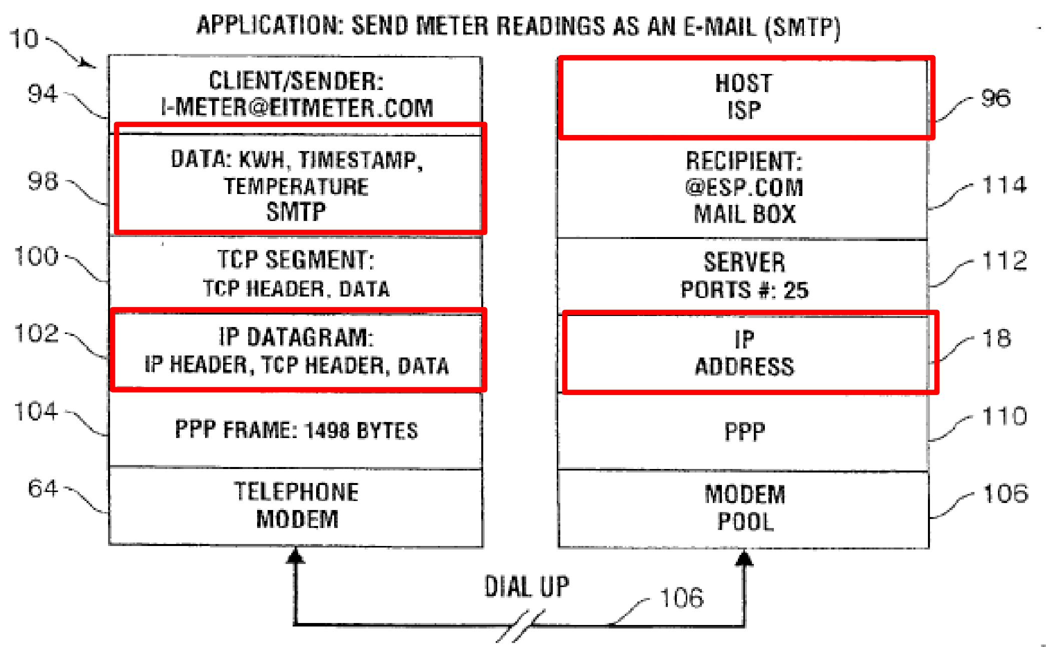
Therefore, Suh discloses receiving the IP-based power consumption information and generating a utility bill based on that information. *See* ITR524-1003, ¶¶ 158-61.

vi. Claim 19: [19A]: The method of claim 17, further comprising transmitting the IP-based power consumption information over an IP-based network

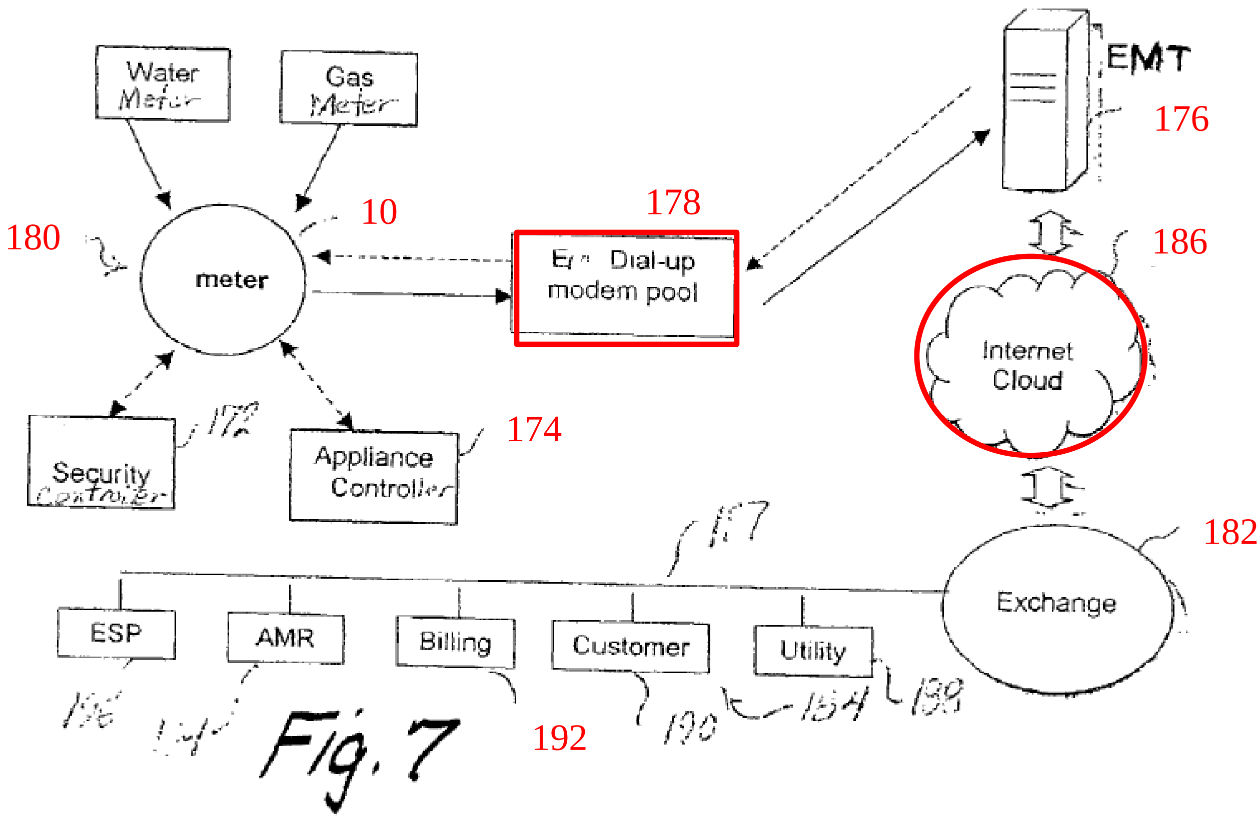
Suh discloses or renders obvious transmitting the IP-based power consumption information over an IP-based network. *See* ITR524-1003, ¶¶ 162-64. For example:

FIG. 4

INTERNET CONNECTION BETWEEN METER AND INTERNET HOST ISP



ITR524-1006, at Fig. 4 (red annotations added);



ITR524-1006, Fig. 7 (red annotations added); *see also* ITR524-1006, at Abstract, ¶¶ 8, 35-36, 49, 53.

The "internet-ready power meter" of Suh teaches sending the power consumption information—for example, kilowatt hour usage—in an IP datagram over the Internet or an internet cloud, using an IP address. ITR524-1006, ¶¶ 8, 35-36, 49, 53, Fig. 4; ITR524-1003, ¶¶ 163-64. In the system shown above in Fig. 4, "the electronic power meter 10 is the client/sender 94 of the data records including the kilowatt hour usage rate, the time stamp, and the temperature. The data records are sent as an e-mail 98 using standard international computer network protocols.

. . . In the subsequent layer, the IP (Internet Protocol) is added to comprise the IP datagram 102 including the IP header, the TCP header and the data." ITR524-1006, ¶¶ 35-36. A POSITA would have understood that this transmission of kilowatt hour usage data to an email address over the Internet using standard network protocols (e.g., TCP/IP) constitutes a transmission of IP-based power consumption data over an IP-based network. ITR524-1003, ¶ 164. Accordingly, Suh teaches that the IP-based power consumption data is transmitted in IP format (for example, as payload data encapsulated with IP headers) over the Internet, which is an IP-based network. ITR524-1003, ¶¶ 152-54, 162-64.

vii. Claim 20: [20A]: The method of claim 17, further comprising wirelessly transmitting the IP-based power consumption information from the processor to the destination.

This claim is dependent on claim 17 and therefore requires both the elements of claim 17, which requires transmission of IP-based power consumption information over an external power line network, and the elements of claim 20, which requires wireless transmission. This could be accomplished by sending the same information to the same destination over separate networks, or by sending different sets of information by, alternatingly, power line network or wireless transmission. ITR524-1003, ¶ 166. This claim element could also be met by sending the information to a destination using both types of networks as different legs of the same transmission (for example, sending the information to an intermediate destination using a power line network, and sending the same information from the intermediate destination to a further destination wirelessly). *Id.*

Suh discloses or renders obvious wirelessly transmitting the IP-based power consumption information from the processor to the destination. *See* ITR524-1003, ¶¶ 165-69. For example:

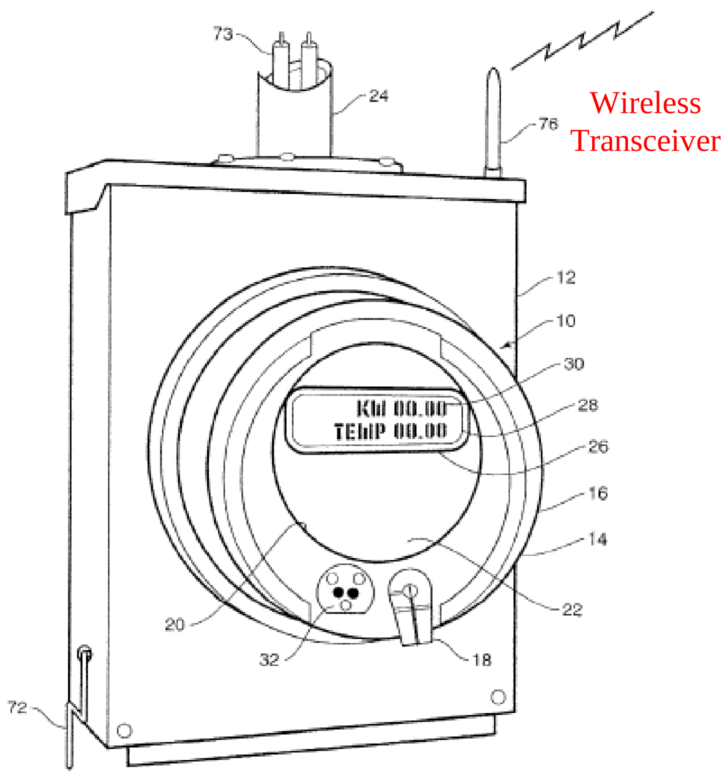


FIG. 1

ITR524-1006, at Fig. 1 (red annotation added); *see also id.* ¶¶ 8, 13, 30, 45.

The "internet-ready power meter" of Suh "includes the communication components necessary to communicate by telephone line, power line or wireless communication systems to periodically transfer collected data to a remote site." *Id.* ¶ 8. In particular, the communications module "may include a radio frequency transceiver for wireless communication of collected data to a wireless service provider for routing to the data collection center." *Id.* ¶ 13. Any and all of the communications modes are available in Suh, leaving the means of transmission to be set at installation, such as based on proximity, density, infrastructure, and preferences.

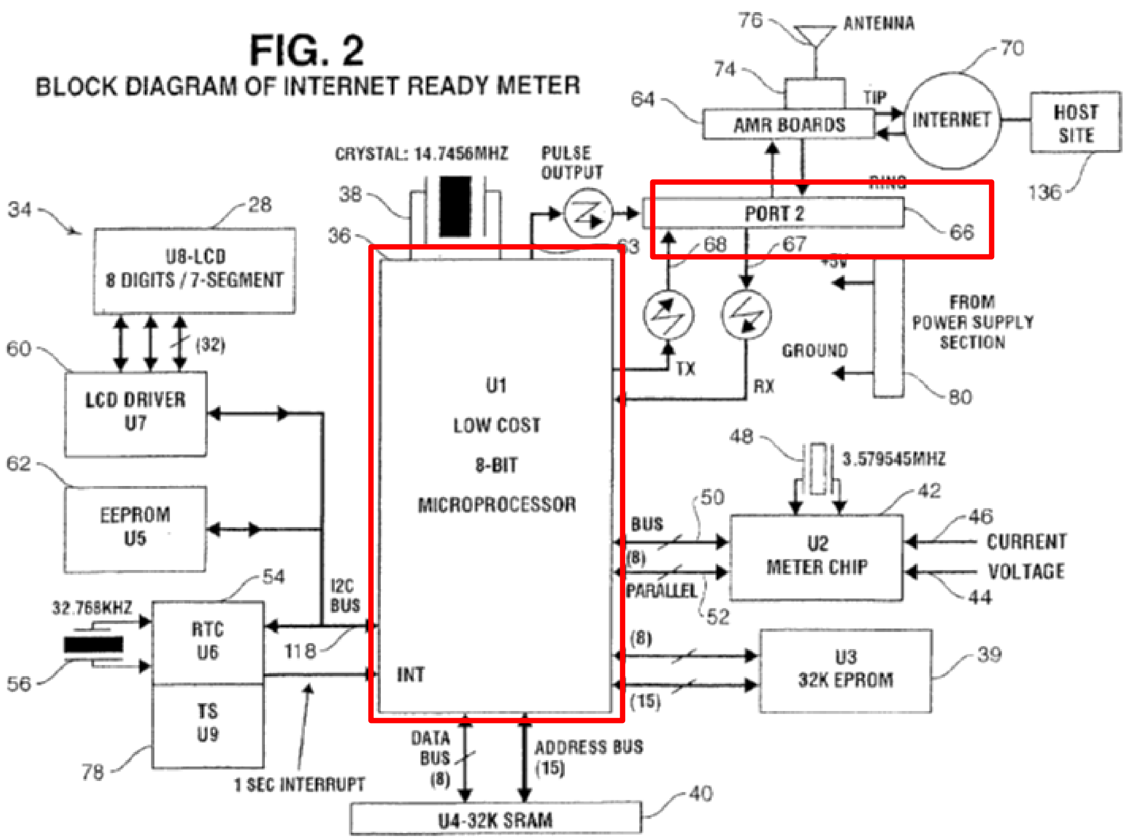
As shown in Fig. 1 of Suh, above, Suh includes both power line communication 73 and wireless communication 76 for transmitting the measured power consumption data to the remote site, either simultaneously or at different times depending on the needs of the utility company. ITR524-1003, ¶¶ 168-69. Furthermore, a POSITA would have understood that wireless communication would have been obvious to use at other stages in the routing from the electric power meter to the destination, including IEEE 802.11 wireless routers used at the utility service providers' locations in Fig. 7 and microwave networks connecting a network of utility meters to the utility service provider. *Id.*

Accordingly, Suh discloses or renders obvious wirelessly transmitting the IP-based power consumption information from the processor to the destination. *See* ITR524-1003, ¶¶ 165-69.

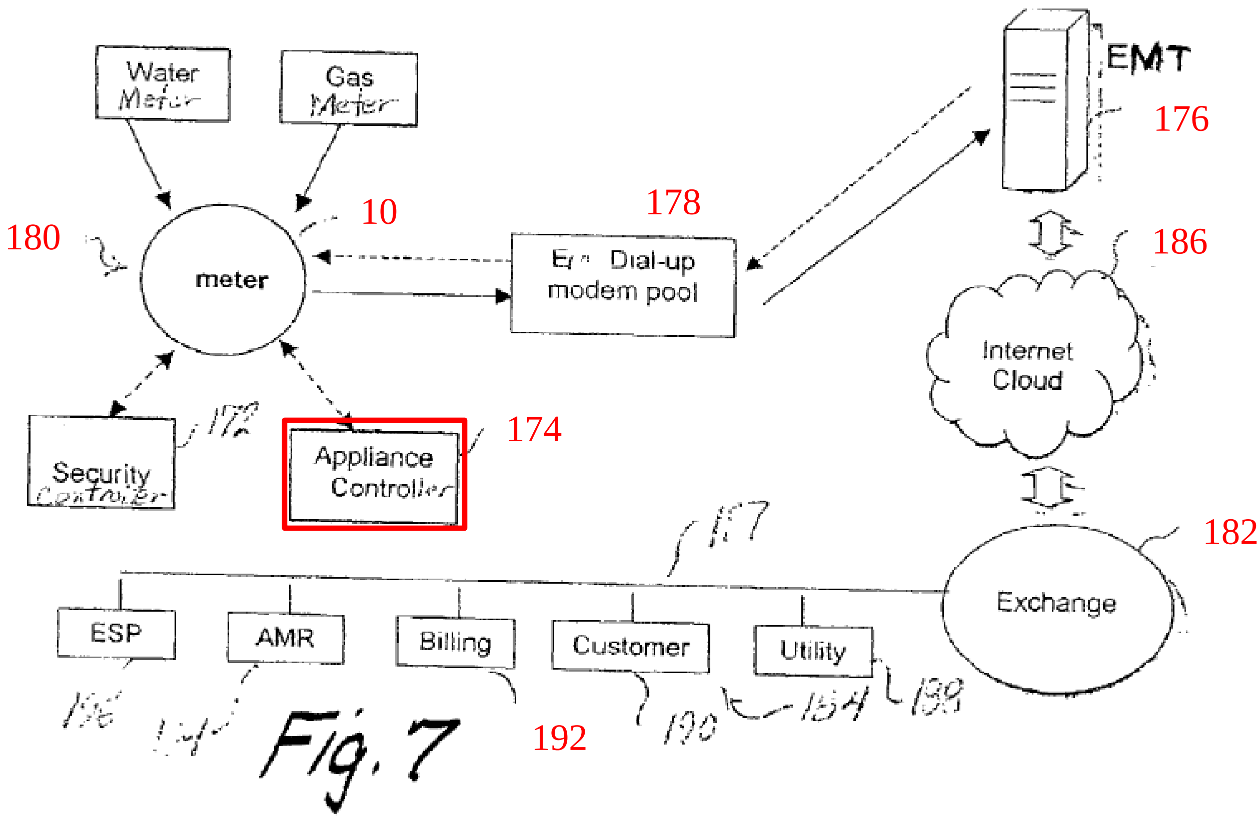
viii. Claim 21: [21A]: The method of claim 17, further comprising: generating a control signal in the processor in response to the power consumption information

Suh discloses or renders obvious generating a control signal in the processor in response to the power consumption information. *See* ITR524-1003, ¶¶ 170-73.

For example:



ITR524-1006, at Fig. 2 (red annotations added).



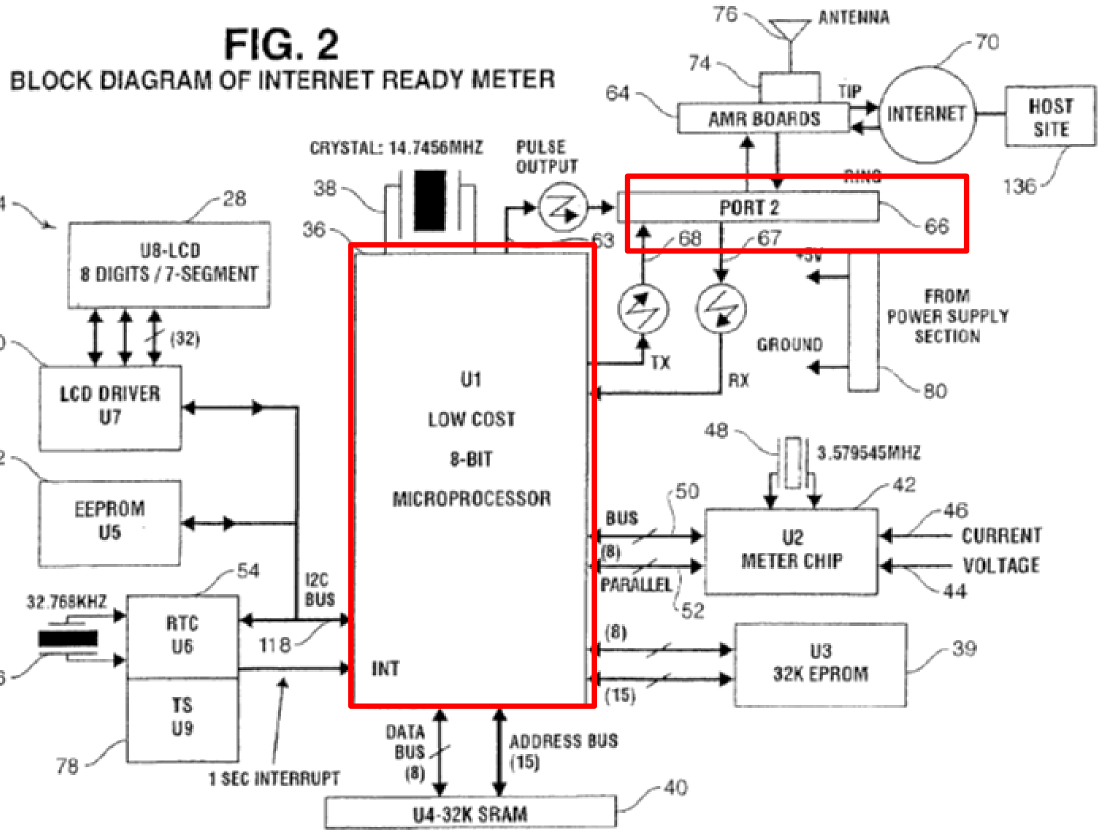
ITR524-1006, Fig. 7 (red annotations added); *see also* ITR524-1006, ¶¶ 3, 28, 50, claims 3, 10.

Suh teaches that appliance controllers are controlled in response to power consumption information: "**[O]ther input and output signals [of microprocessor 36] are transmitted through port 66 to operate and monitor other electronic system controllers such as** a site security controller 172 or **appliance controller 174**. **This permits** control of or response to site security situations or **control and operation of site appliances like air conditioners, heaters, lights and other appliance systems that are clients of the power meter 10.**" ITR524-1006, ¶ 50 (emphasis added). Suh teaches that a client's or customer's ability to track power usage in real time enables site automation and appliance control. ITR524-1006, ¶ 3. Further, claim 10 of Suh recites that "the utility meter has means for remotely controlling appliances at the site of the electronic utility meter in response to costs for the utility being provided."

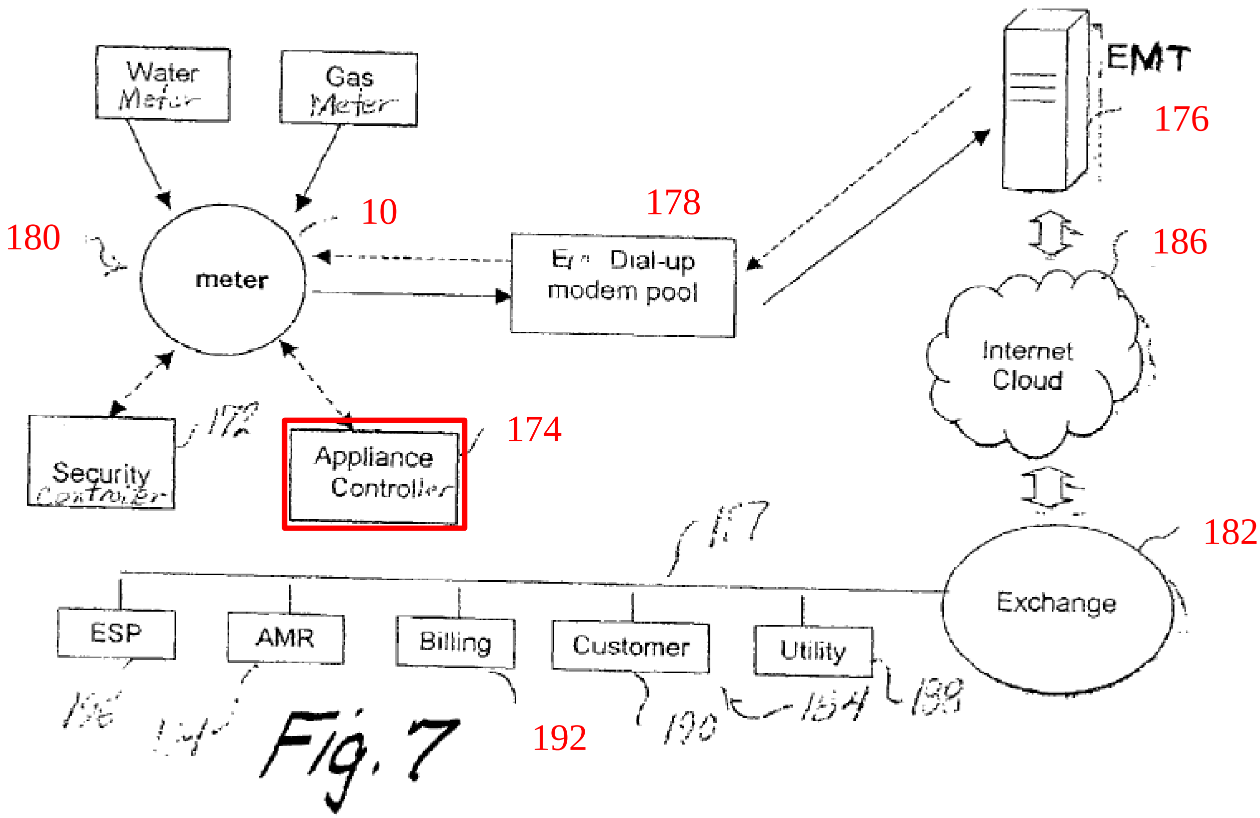
Accordingly, Suh teaches that appliances connected to the utility meter are controlled by sending control signals from the energy meter to the appliance controller in response to real-time monitoring of power usage and temperature information. ITR524-1003, ¶¶ 170-73.

ix. *Claim 21: [21B]: transmitting the control signal to an appliance; and controlling the appliance with the control signal.*

Suh discloses or renders obvious transmitting the control signal to an appliance and controlling the appliance with the control signal. *See* ITR524-1003, ¶¶ 174-75. For example:



ITR524-1006, at Fig. 2 (red annotations added).



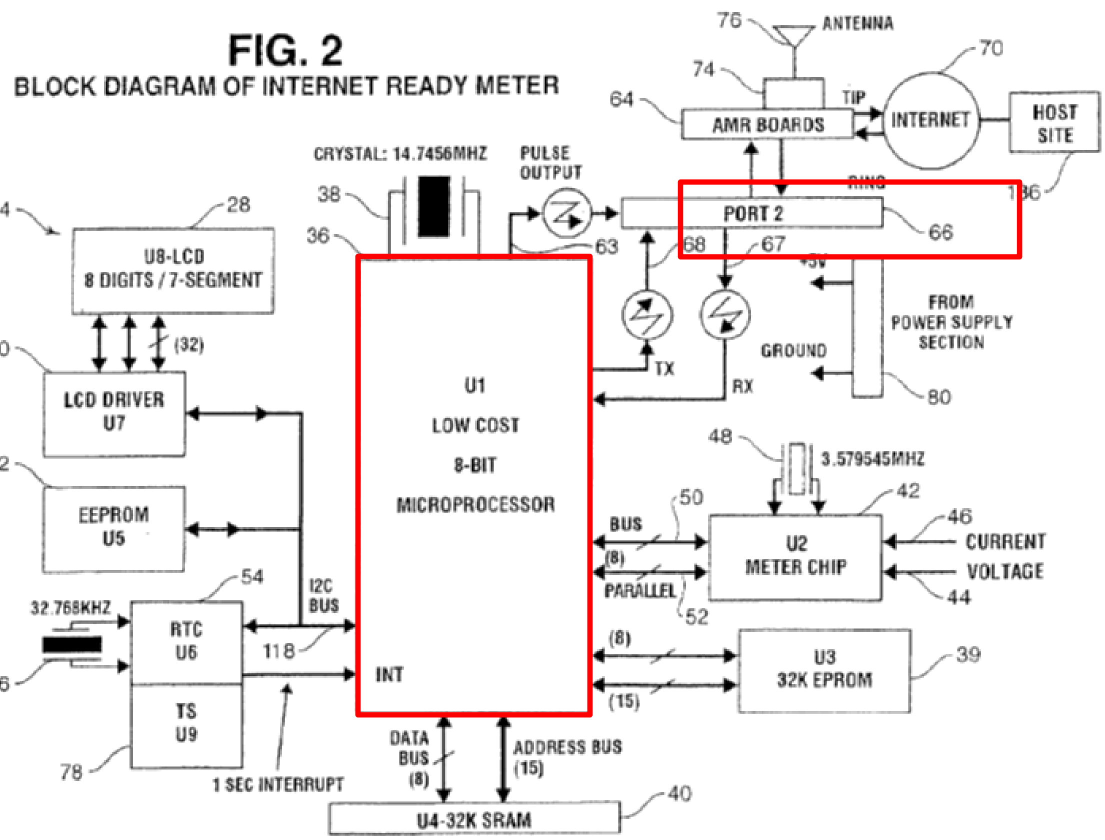
ITR524-1006, Fig. 7 (red annotations added); *see also id.* ¶¶ 3, 28, 50, claims 3, 10.

As described above, Suh teaches that appliances are controlled by appliance controllers, which are controlled by the microprocessor of the power meter. *Id.* ¶ 50 (emphasis added). Suh teaches that a client's or customer's ability to track power usage in real time enables site automation and appliance control. *Id.*, ¶ 3.

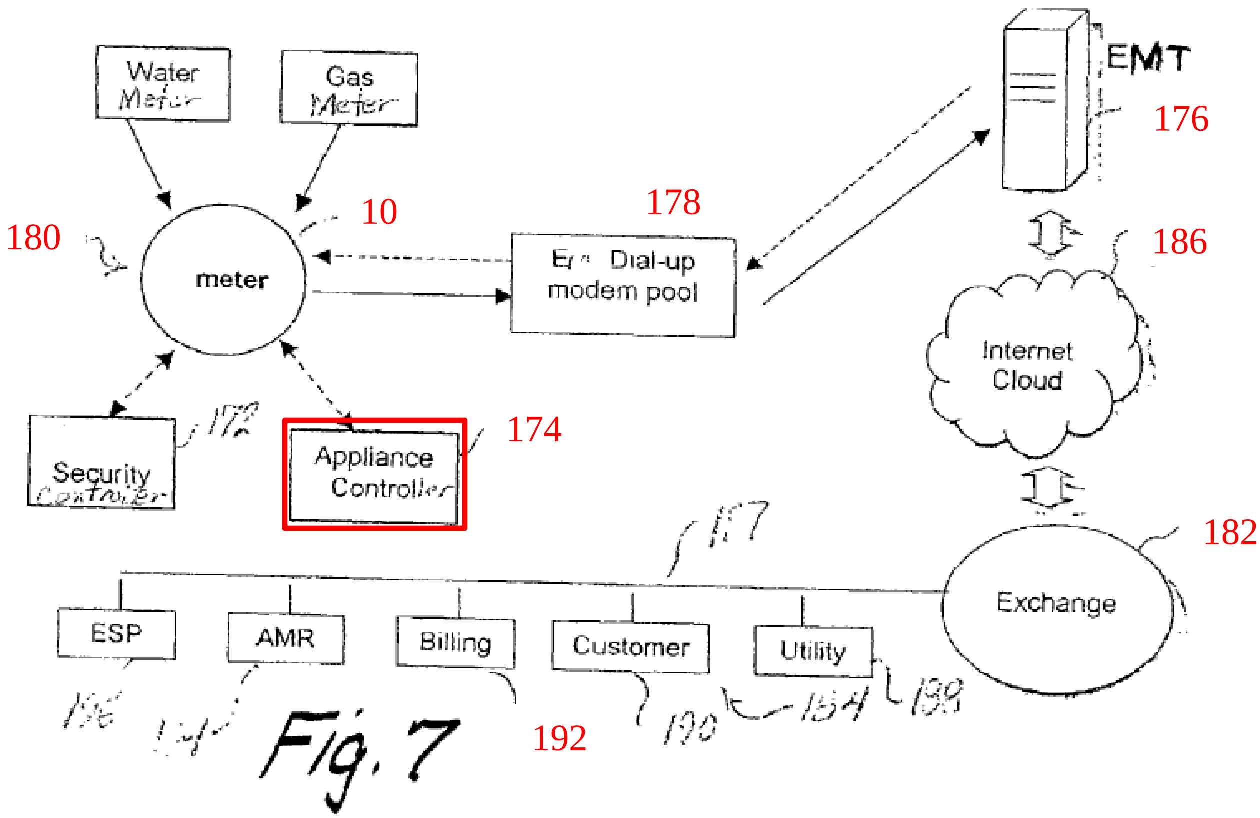
Accordingly, Suh teaches that appliances connected to the utility meter are controlled by transmitting control signals to the appliance and controlling the appliance using those control signals. ITR524-1003, ¶¶ 174-75.

x. ***Claim 22: [22A]: The method of claim 21, wherein the step of controlling the appliance comprises turning the appliance off in response to increased power consumption.***

Suh discloses or renders obvious turning the appliance off in response to increased power consumption as part of the step of controlling the appliance. ITR524-1003, ¶¶ 176-78. For example:



ITR524-1006, at Fig. 2 (red annotations added).



ITR524-1006, Fig. 7 (red annotations added); *see also id.* ¶¶ 3, 28, 50, claims 3, 10.

As described above, Suh teaches that appliances are controlled by appliance controllers. *Id.* ¶ 50 (emphasis added). A client or customer has access to the power measurement data and temperature, and, "if desired," may use that data "for temperature control functions, for example, regulation of air conditioning systems." *Id.* ¶ 28. Suh also teaches that a client's or customer's ability to track power usage in real time enables site automation and appliance control. *Id.*, ¶ 3.

The passages above indicate that the utility meter of Suh was able to remotely control appliances, including appliances like air conditioning systems and lighting, in response to monitoring power usage. Because the primary (if not only) available controls for lighting are to turn the lights on or off, it would have been obvious to a POSITA to use the appliance controllers taught by Suh to turn off lighting and other appliances, such as air conditioning systems, connected to the utility meter in response to monitoring real-time power usage information. ITR524-1003, ¶ 177-78. For example, a POSITA would have understood that when increased power consumption is detected late, Suh's system could be enabled (controlled) to turn off appliances in response to the increased power usage readings to reduce power consumption and reduce utility bills. *Id.* ¶ 178. A POSITA would have also known that the utility company would want to reduce power consumption during periods of increased power consumption, and that this could be accomplished by disabling appliances in response to high power usage. *Id.* ¶ 177-78.

Accordingly, Suh teaches or renders obvious that appliances connected to the utility meter may be turned off in response to increased power consumption. *Id.* ¶¶ 176-78.

B. <u>Count 2: Claims 17-22 are unpatentable under 35 U.S.C. §103(a) over Suh in light of Bartone</u>

i. Motivation to Combine

The rationale for considering Suh is in Part XI.A, *supra*.

To the extent that the Board finds that Suh does not explicitly teach any of the elements of the Challenged Claims, there is a teaching, suggestion, or motivation for combining Suh with Bartone, which also teaches all claim elements. ITR524-1003, ¶¶ 179-87. Suh and Bartone both describe systems for measuring energy usage and reporting that measurement data back to a remote site, including the utility server provider. ITR524-1006, Abstract, ¶ 9; ITR524-1007, Abstract, 2:31-36.

Suh discloses an Internet-ready energy meter that provides energy management, such as for an air conditioning unit, and Bartone discloses a utility management system that connects to energy meters through the Internet. ITR524-1006, Abstract, Figs. 1-2; ITR524-1007, Abstract, 4:66-5:7, Fig. 1. Dr. Akl states:

> A POSITA would also have been motivated to use the Internet-ready energy meter taught by Suh in the overall utility management architecture of Bartone because Suh teaches a power measurement device and a transceiver enclosed in one housing and could therefore form a simple substitute for the two separate devices, the power measurement device 50 and the facility transceiver 36, taught in Bartone.

ITR524-1003, ¶ 179.

Furthermore, a POSITA would have been motivated to combine the power line network transceiver on the energy meter taught in Suh with Bartone's energy meter and system, notwithstanding the fact that Bartone also teaches a wireless transceiver for communicating data back to the centralized server over the Internet, because redundant communications technologies allow enhanced communication reliability. ITR524-1003, ¶¶ 182-86. Suh teaches using up to three different types of communications transceivers on a single energy meter, including wireless and power line transceivers. ITR524-1006, Fig. 1. Therefore, in the event of a transceiver or network failure on one network, the energy meter could still communicate with the data server using the other network. ITR524-1003, ¶¶ 182-86. Further, Dr. Akl explains that there are some installations, such as rural installations, where a wireless system would have been cost prohibitive or impractical or where adding power line networking in addition to existing wireless networks would be desirable. ITR524-1003, ¶ 186; *see also* ITR524-1017, p. 1.

Accordingly, a POSITA would have been motivated to combine Suh and Bartone by substituting known elements of one system in the other system to reduce complexity and allow for additional communications functionality. Given the similarity in technology, a POSITA would have expected success given that Suh simply adds additional known communication paths that were already known to carry power consumption information in other power meter networks.

ii. Claim 17: [17 Pre] A method of measuring power consumption information on a power line comprising:

This section incorporates the corresponding Suh disclosure for Limitation [17 Pre] in Part XI.A, *supra*.

Bartone also discloses or renders obvious a method of measuring power consumption information on a power line. *See* ITR524-1003, ¶¶ 188-90. For example: the system of Bartone "includes a power measurement device within each facility, to measure power consumption by power consuming devices within the facility; a communications network, in communication with the device controllers and the power measurement devices." ITR524-1007, 4:11-15. Bartone teaches the use of power measurement devices that monitor power consumption at the main power feed: "The facility transceiver unit 36 also receives information from a power measurement device 50, which monitors power consumption within the facility 26 at a source such as the main power feed 31." *Id.* 5:32-35

Furthermore, Bartone teaches device controllers that both control appliances and monitor power consumption on the power line: "The device controller 30 can also monitor whether the power consumption devices [sic] 28 is drawing power, or even measure much more detailed information, for example the amount of power consumed, and the state of the power consumption device 28. Typically the power cord of the power consumption device 28 is simply plugged into a power outlet on the device controller 30, although other connections and controls are possible." *Id.* 5:21-28.

Accordingly, "the device controllers 30 and the power measurement devices 50 in Bartone both measure the power usage—for example, true power consumption in kilowatt-hours—at either power lines connected to the appliances themselves or at the main power line for the facility." ITR524-1003, ¶ 190.

iii. Claim 17: [17A] measuring current fluctuations in the power line and [17B] calculating power consumption information from the current fluctuations in a processor:

This section incorporates the corresponding Suh disclosure for Limitations [17A] and [17B] in Part XI.A, *supra*.

Bartone also discloses or renders obvious measuring current fluctuations in the power line and calculating power consumption information from the current fluctuations in a processor. ITR524-1003, ¶¶ 191-93. For example:

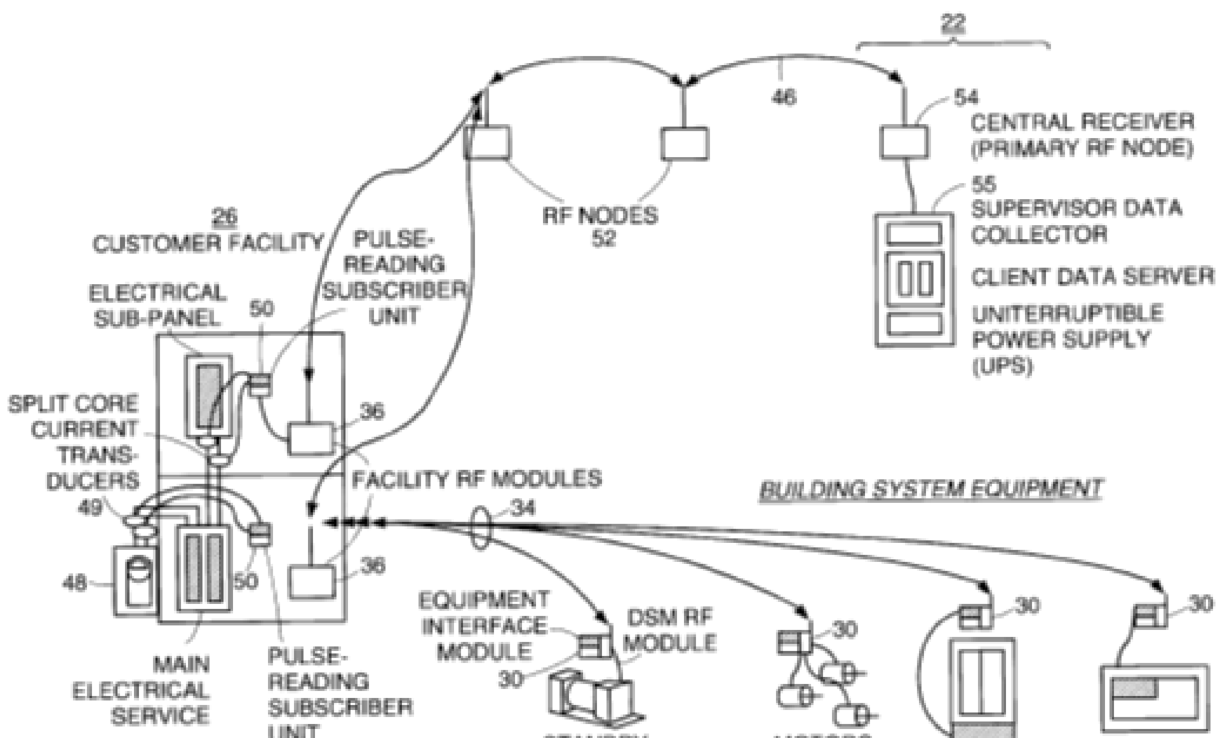


FIG. 3

ITR524-1007, Fig. 3;

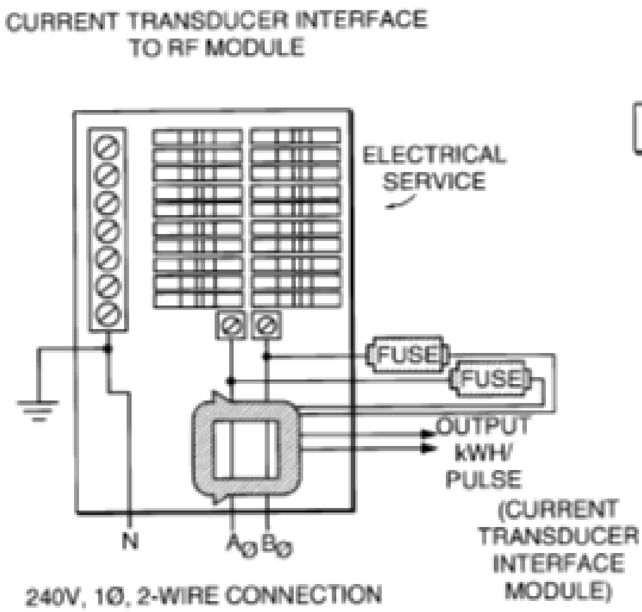


FIG. 11A

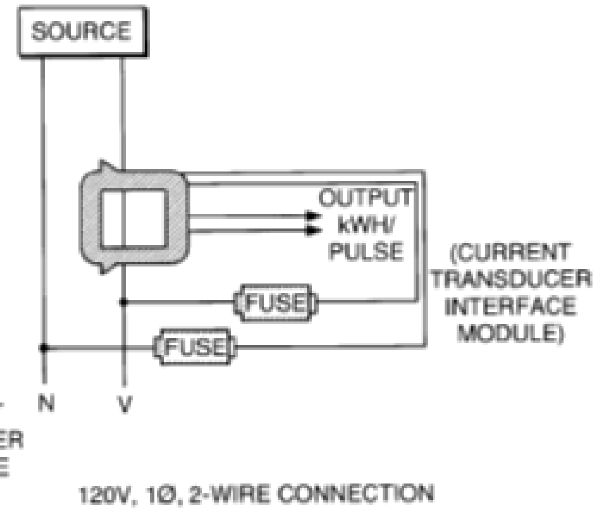


FIG. 11B

ITR524-1007, Figs. 11A-11B;

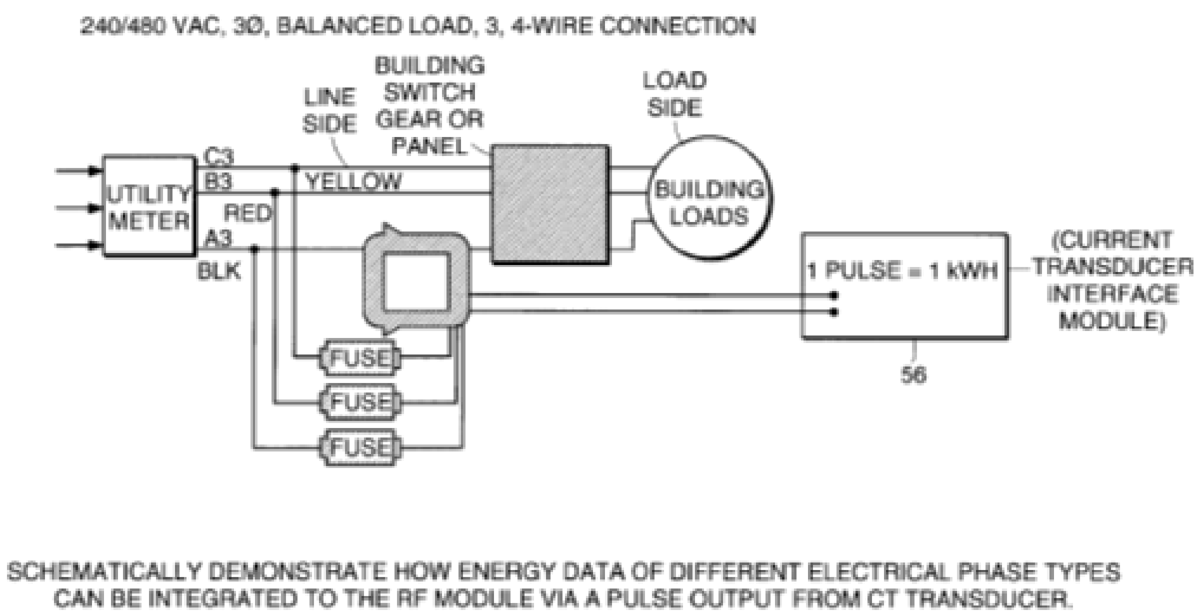


FIG. 11C

ITR524-1007, Fig. 11C.

Fig. 11 of Bartone "provides details about measuring current for varying electric phases within end user facilities 26. . . . The current transducer interface 50 acts as the conversion device for energy data collected via current transducers 49 and sent through the facility RF module 36. **The current transducer 49 measurement** is converted to pulse output by the current transducer interface 50. **The transducer measures true power consumption (kilowatt-hours)**." ITR524-1007, 11:63-12:6 (emphasis added).

Furthermore, Bartone teaches that the device controllers also measure power consumption so as to calculate the claimed power consumption information: "According to the present invention, one or more power consumption device 28 is connected 32 to a device controller 30, wherein the device controller 30 can control the power consumption device 28. The device controller 30 can also monitor whether the power consumption devices [sic] 28 is drawing power, or even measure much more detailed information, for example the amount of power consumed, ... Typically the power cord of the power consumption device 28 is simply plugged into a power outlet on the device controller 30, although other connections and controls are possible." ITR524-1007, 5:17-28.

Accordingly, the power measurement device of Bartone uses a current transducer to measure current fluctuations in order to calculate power consumption information—the amount of kilowatt-hours of power—actually used at a facility. *Id.*

11:61-12:14. A POSITA would have understood that this calculation would be performed using a processor in the device. ITR524-1003, ¶ 193. Changes in current measured over time would be reflected as measured changes in true power consumption in kilowatt-hours. *Id.* ¶¶ 192-93. Furthermore, the device controllers of Bartone also are capable of measuring the amount of power consumed, and would also include a processor for performing this measurement. ITR524-1007, 5:12-28; ITR524-1003, ¶¶ 192-93. A POSITA would also have understood that it would have been obvious for Bartone's system to measure power consumption by measuring current fluctuations on a power line, as detailed in Suh and described in the '524 APA. *See* ITR524-1003, ¶¶ 191-93.

iv. Claim 17: [17C] converting the power consumption information into IP-based power consumption information in the processor:

This section incorporates the corresponding Suh disclosure for Limitation [17C] in Part XI.A, *supra*.

Bartone also discloses transmitting packetized measurement information over the Internet, and a POSITA would have understood that the Internet Protocol was for "use in interconnected systems of packet-switched computer communication networks." ITR524-1009, p. 1; ITR524-1003, ¶ 195; *see also* ITR524-1003, ¶¶ 194-97. According to Dr. Akl, "a POSITA attempting to send measurement data over the Internet would have known that it would need to be packetized, and would have relied on the known IPv4 protocol, as taught in the '524 APA and Suh, to packetize and transmit that data." ITR524-1003, ¶ 195. Given the communications mechanisms of the time, a packet switched network would have likely required or suggested the use of the IPv4 protocol, which in turn, would generate IP datagrams that encapsulate the data to be transmitted, including power consumption information.

For example, Bartone teaches that an embodiment of the invention "uses a 2-way wireless system in combination with Internet communications to packetize and transmit data from an end user's point source to and from a Centralized Data Center where sophisticated analysis can be performed." ITR524-1007, 3:8-11. Furthermore, in Bartone, "The Internet is also used to provide valuable real-time energy use and cost information back to the end user or for service provider technicians that provide energy monitoring and management services." *Id.* 7:63-66. Internet communications commonly, if not always, relied on IP packets. ITR524-1003, ¶ 196.

Accordingly, the energy use data transmitted in Bartone "is transmitted over a variety of networks, including over the Internet, and so a POSITA would have been motivated to send the energy measurement data with IP headers to maximize the compatibility with a variety of different networks, including the Internet." ITR524-1003, ¶ 197. To the extent it is argued that Bartone does not teach IP packets, a

POSITA would have modified Bartone to utilize IP-based communications. *See* Part XI.A.iii. According to Dr. Akl, "a POSITA would have been motivated to combine the disclosure of Bartone with the IP-based communication taught in Suh to transmit energy usage data over the Internet, in order to provide valuable real-time energy use to the end user and to energy service providers, as Bartone indicates that is a goal of its system." ITR524-1007, 6:10-8:14; ITR524-1003, ¶ 181; *see also* analysis of Limitation [17D].

v. Claim 17: [17D]: transmitting the IP-based power consumption information from the processor to a destination autonomously in IP format over an external power line network

This section incorporates the corresponding Suh disclosure for Limitation [17D] in Part XI.A, *supra*.

The power measurement information transmitted in Bartone can be preset to be automatically transmitted to the central station location in periodic time intervals, such as every 15, 30, or 60 minutes. ITR524-1007, 10:32-62 ("Energy use data can be preset to be acquired, transmitted and delivered to a central station location in user selectable time intervals, or standard increments such as 15 minute, 30 minute, 1 hour and up intervals . . . ."). This means that the end-user's location itself, without external prompting, collects and transmits the collected energy use information at preprogrammed time intervals. Accordingly, Bartone's power measurement information is transmitted "autonomously" as claimed.

Bartone also discloses transmitting its power consumption information over the Internet automatically every 15, 30, or 60 minutes using power carrier signals, and a POSITA would have understood that the Internet Protocol was for "use in interconnected systems of packet-switched computer communication networks." ITR524-1009, p. 1; ITR524-1003, ¶¶ 198-203. To the extent it is argued that Bartone does not teach IP packets, when combined with Suh, the combination relies on IP-based communications, as detailed above in connection with Limitation [17C]. According to Dr. Akl, "a POSITA attempting to send measurement data over the Internet would have known that it would need to be packetized, and would have relied on the known IPv4 protocol, as taught in the '524 APA and Suh, to packetize and transmit that data. To the extent it is argued that Bartone does not teach transmitting information in IP format, by combining the teachings of Bartone and Suh, a POSITA would have known that they could transmit the IP-based power consumption information over power carrier signal to the data communications center for management of controlled facilities and appliances." ITR524-1003, ¶ 201. For example:

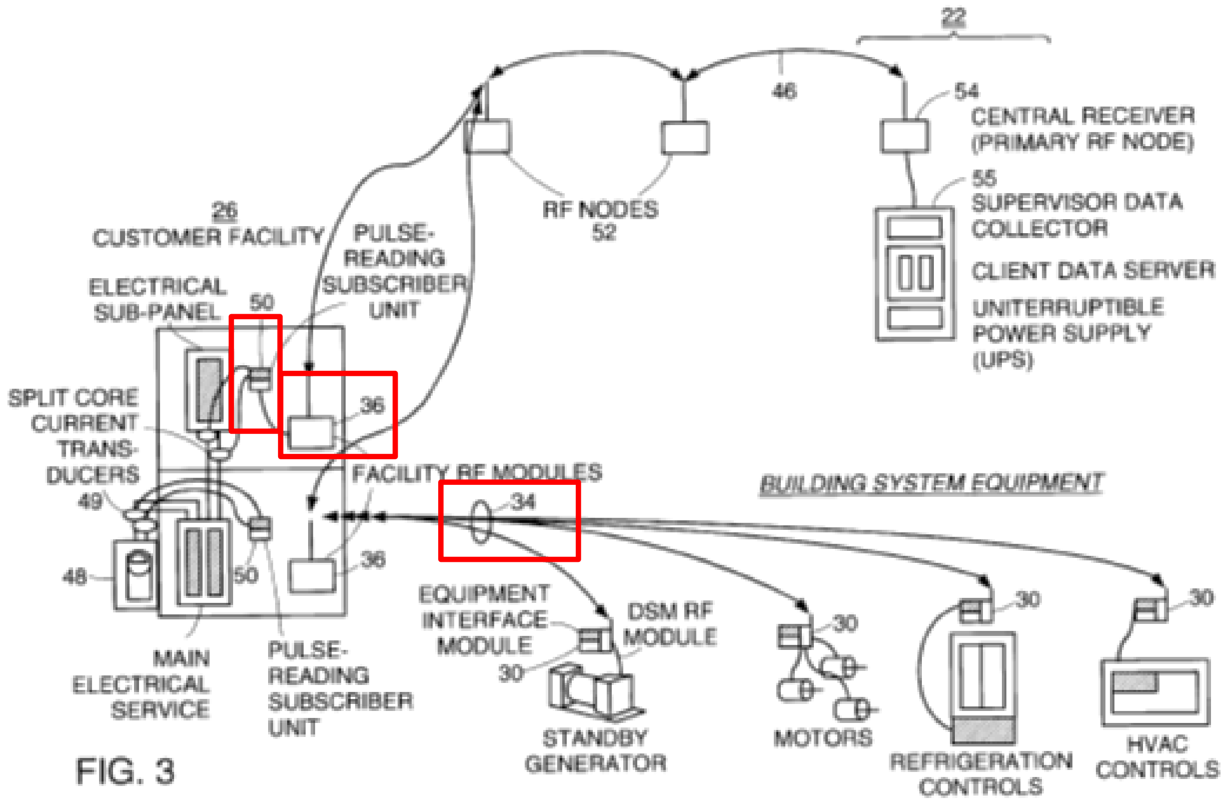


FIG. 3

ITR524-1007, Fig. 3 (red annotations added). Bartone teaches:

> This centralized data center 22 System allows real-time energy use information to be collected and managed at a central location. The centralized data center 22 system has a direct connection with the Internet or other communications network to provide connections between other centralized data center systems located within the field.

ITR524-1007, 7:57-63. Furthermore, Bartone teaches that communication between device controllers and power measurement devices (over communications network 34) can be by "any form of communication," expressly including wireless communication and power carrier signals. *Id.* 5:29-45.

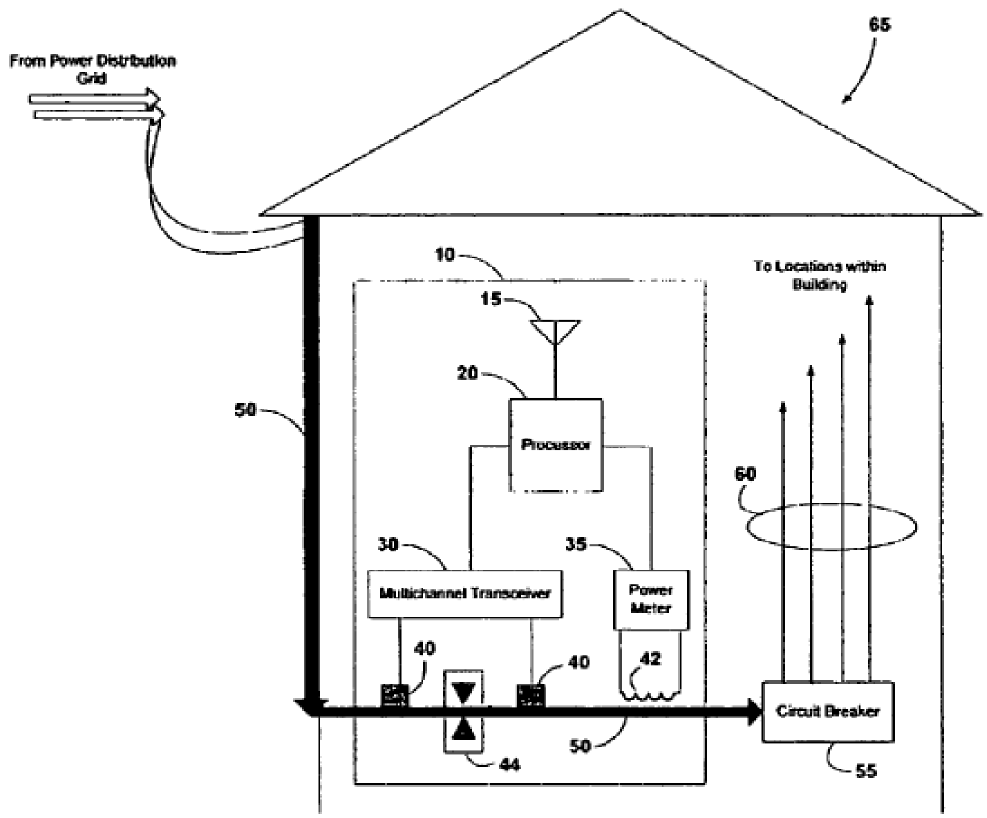
Bartone therefore teaches a system where device controllers and power measurement devices (both of which measure power usage information from the power line, at the facility level and at the appliance level) communicate power usage data over the Internet, with the device controllers optionally using power line carrier signals to transmit the information. ITR524-1003, ¶ 202. That power line network lies between the power meter (here, the device controller, which also serves as a power meter) and the power measurement device at the main facility, and are therefore "external" power line networks. According to Dr. Akl,

> It would have been obvious to a POSITA to transmit the power consumption information as IP-based data in order to make the data easy to transmit over the Internet. Furthermore, it would have been obvious . . . to combine the system of Bartone with the IP-based communication of Suh over power line carrier.

ITR524-1003, ¶ 203.

The '524 Patent specification explains that the term "external," in reference to transmission over networks, refers to transmission of data signals on a network located outside of the building where the computer 24 of the invention is located (as opposed to an "internal" network, which lies within the building). ITR524-1001, 5:2-5. Fig. 1 of the '524 Patent illustrates how a power meter connects to the power supply grid:

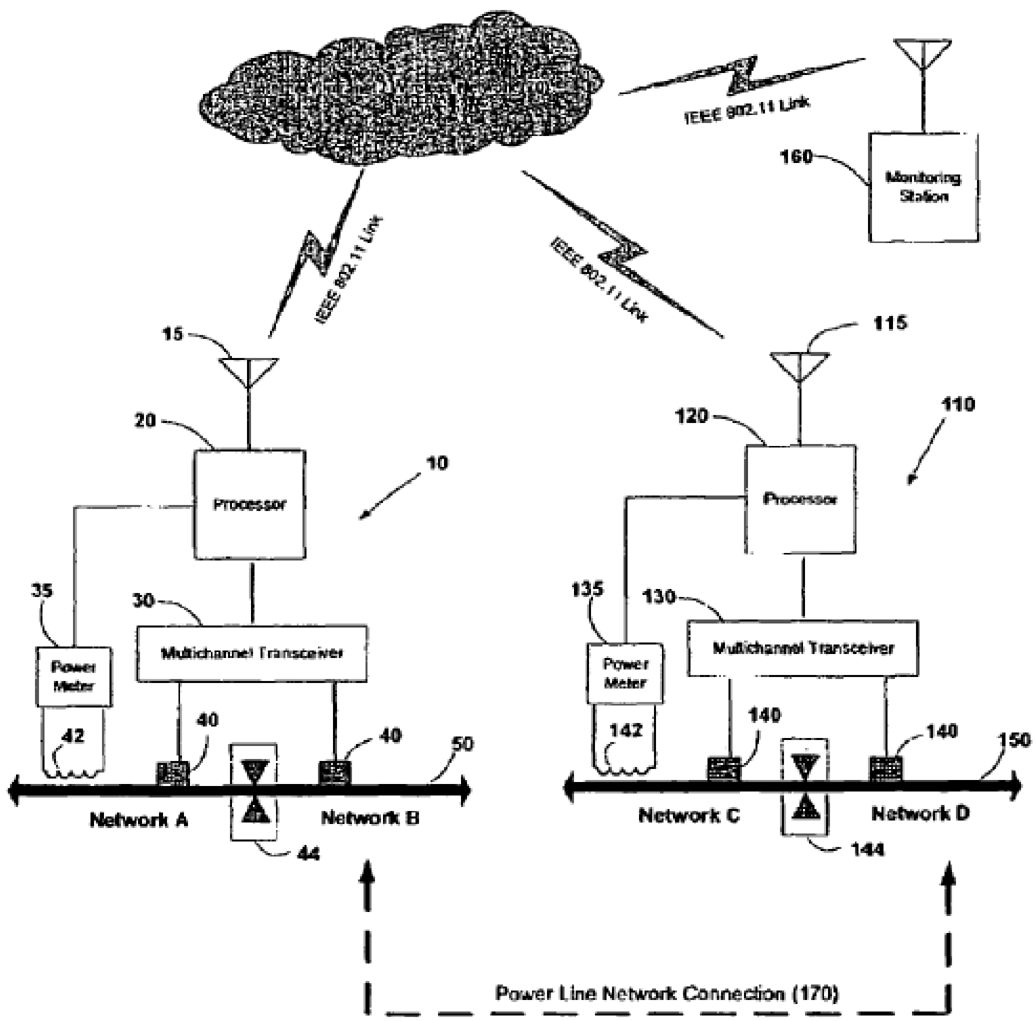
FIG. 1



ITR524-1001, Fig. 1. The power meter of the claimed invention lies on a portion of the power line 50 that connects to the power distribution grid. ITR524-1001, 2:57-60. The power meter is depicted and described as being installed "**in** a dwelling" 65. ITR524-1001, 2:57-59 (emphasis added). While the power meter may be placed external to the circuit breaker, the '524 Patent specification makes clear that "the power meter could be placed at any location along a power line, including **within** a single-family dwelling." or at multiple locations throughout a multi-family dwelling. ITR524-1001, 3:2-16 (emphasis added).

Fig. 3 of the '524 Patent illustrates an embodiment of the invention in which an external power line network connection, 170, connects two dwellings. IPR524-1001, at 5:46-7:9. No illustration of the interior or exterior of the dwelling is depicted in Fig. 3.

FIG. 3



ITR524-1001, Fig. 3.

The power line connection 170 uses a standard power line network protocol (e.g., HomePlug) to allow the transmission of IP data between the power lines 50 and 150. ITR524-1001, 6:66-7:3. A POSITA would have understood that HomePlug transceivers at the time of the invention would, like the power meters in the preferred embodiments, be located inside a house, for example, connected to a standard wall power outlet. *See, e.g., id.* 7:45-53; ITR524-1010, pp. 4, 80. Portions of the power lines 50 and 150 internal to the dwellings (between the wall power outlet and the exterior of the dwelling or household) would be internal to the building but still comprise a portion of the claimed "external power line network" because they would be "external" to the power meter and power line transceiver located within the dwelling. Accordingly, the preferred embodiment of the '524 Patent would include portions of the power line within the building as part of the external power line network.

Claim 1 of the '524 Patent explains that power line networks are divided into "internal" networks and "external" networks by the existence of the claimed power meter on the power line, meaning that the location of the power meter itself defines what parts of the power line network are "internal" (e.g., those portions between the power meter and the appliances) and which are "external" (e.g., those portions between the power meter and the power distribution grid). ITR524-1001, at 9:42-45.

Accordingly, the power line networks used in Bartone are within the scope of what the '524 Patent discloses for external power line networks. Should the Board find that these networks are not external power line networks, it would have been obvious to use the same technology to transmit the power consumption information outside of a building, for example, as suggested by Suh. ITR524-1003, ¶ 209.

Accordingly, Bartone, either alone or in combination with Suh, teaches or renders obvious the step of transmitting the IP-based power consumption information from the processor to a destination autonomously in IP format over an external power line network. *See* ITR524-1003, ¶¶ 198-209.

vi. Claim 18: [18A]: The method of claim 17, further comprising: receiving the IP-based power consumption information at the destination; and calculating a utility bill using the IP-based power consumption information.

This section incorporates the corresponding Suh disclosure for Limitation [18A] in Part XI.A, *supra*.

Bartone also discloses or renders obvious receiving the IP-based power consumption information at the destination, and calculating a utility bill using the IP-based power consumption information. *See* ITR524-1003, ¶¶ 210-15. In fact, Bartone teaches that the ability to efficiently collect metering data "for billing purposes" is a focus of metering technologies and manufacturers. ITR524-1007, 1:47-60. For example, Bartone teaches that its system offers a number of advantages, including the ability to provide sub-metering and utility billing services: "3. Sub-Metering & Utility Billing Services. The system has the ability to provide sub-metering and utility billing services to those market segments that conduct business and relationships where these services may provide high value." ITR524-1007, 8:15-19. Another advantage of the system is the ability to provide utility bill audit and verification services: "The system software will then calculate the customer's monthly bill to be checked and verified against the actual LDC utility bill." *Id.* 8:54-56.

Accordingly, Bartone discloses that calculating a utility bill using the IP-based power consumption information is taught or made obvious by Bartone alone or the combination of Bartone and Suh. *See* ITR524-1003, ¶¶ 210-15.

vii. Claim 19: [19A]: The method of claim 17, further comprising transmitting the IP-based power consumption information over an IP-based network

This section incorporates the corresponding Suh disclosure for Limitation [19A] in Part XI.A, *supra*.

Bartone also discloses transmitting packetized measurement information over the Internet, and a POSITA would have understood that the Internet Protocol was for "use in interconnected systems of packet-switched computer communication networks." ITR524-1009, p. 1; ITR524-1003, ¶ 218; *see also* ITR524-1003, ¶¶ 216-19. According to Dr. Akl, "a POSITA attempting to send measurement data over the Internet would have known that it would need to be packetized, and would have relied on the known IPv4 protocol, as taught in the '524 APA and Suh, to packetize and transmit that data." ITR524-1003, ¶ 218.

For example, Bartone teaches that an embodiment of the invention, "uses a 2-way wireless system in combination with Internet communications to packetize and transmit data from an end user's point source to and from a Centralized Data Center where sophisticated analysis can be performed." ITR524-1007, 3:8-11; *see also id.* 7:56-8:14.

Accordingly, the energy use data transmitted in Bartone "is transmitted over a variety of networks, including over the Internet, and so a POSITA would have known, and been motivated, to send the energy measurement data with IP headers to maximize the compatibility with a variety of different networks, including the Internet." ITR524-1003, ¶ 219. A POSITA would have understood that the Internet is an IP-based network. *Id.* ¶ 219. According to Dr. Akl, "a POSITA would have been motivated to combine the disclosure of Bartone with the IP-based communication taught in Suh to transmit energy usage data over the Internet, in order to provide valuable real-time energy use to the end user and to energy service providers, as Bartone indicates that is a goal of its system." *Id.* ¶ 181; ITR524-1007, 6:10-8:14.

Accordingly, Bartone, alone or in combination with Suh, discloses transmission of IP-based data over an IP-based network, e.g., the Internet.

viii. Claim 20: [20A]: The method of claim 17, further comprising wirelessly transmitting the IP-based power consumption information from the processor to the destination.

This section incorporates the corresponding Suh disclosure for Limitation [20A] in Part XI.A, *supra*.

Bartone also discloses or renders obvious wirelessly transmitting the IP-based power consumption information from the processor to the destination. *See* ITR524-1003, ¶¶ 220-26. For example, Bartone teaches, "[a]t least one embodiment of the invention uses a 2-way wireless system in combination with Internet communications to packetize and transmit data from an end user's point source to and from a Centralized Data Center where sophisticated analysis can be performed utilizing complimentary data to initiate more effective control." ITR524-1007, 3:7-12.

Bartone teaches packetizing and transmitting energy use information over a power line carrier, over a wireless network, and over the Internet. ITR524-1007, 2:31-3:12. A POSITA would have understood that this data would have been sent with IP headers in order to transmit the information wirelessly over the Internet. ITR524-1003, ¶ 224. As noted above, the combined system of Bartone and Suh is capable of transmitting over external power lines and also over a wireless network.

The passages above indicate that the Bartone facilities and device controllers may transmit the IP-based power consumption information from the power measurement device and device controllers via power line carrier and wireless transmission. ITR524-1007, 3:1-12. A POSITA also would have known and understood that redundant communications technologies allow enhanced communication reliability, and therefore would have been motivated to use both types of networks suggested in Bartone and Suh. ITR524-1003, ¶ 225.

Furthermore, a POSITA would have known that it would have been obvious to use wireless communication at other stages in the routing from the electric power meter to the destination, including IEEE 802.11 wireless routers used at the utility service providers' locations and microwave networks connecting a network of utility meters to the utility service provider. ITR524-1003, ¶ 226.

ix. Claim 21: [21A]: The method of claim 17, further comprising: generating a control signal in the processor in response to the power consumption information

This section incorporates the corresponding Suh disclosure for Limitation [21A] in Part XI.A, *supra*.

Bartone also discloses or renders obvious generating a control signal in the processor in response to the power consumption information. *See* ITR524-1003, ¶¶ 227-30. For example, Bartone teaches device controllers that can both measure power consumption and use control signals to control devices:

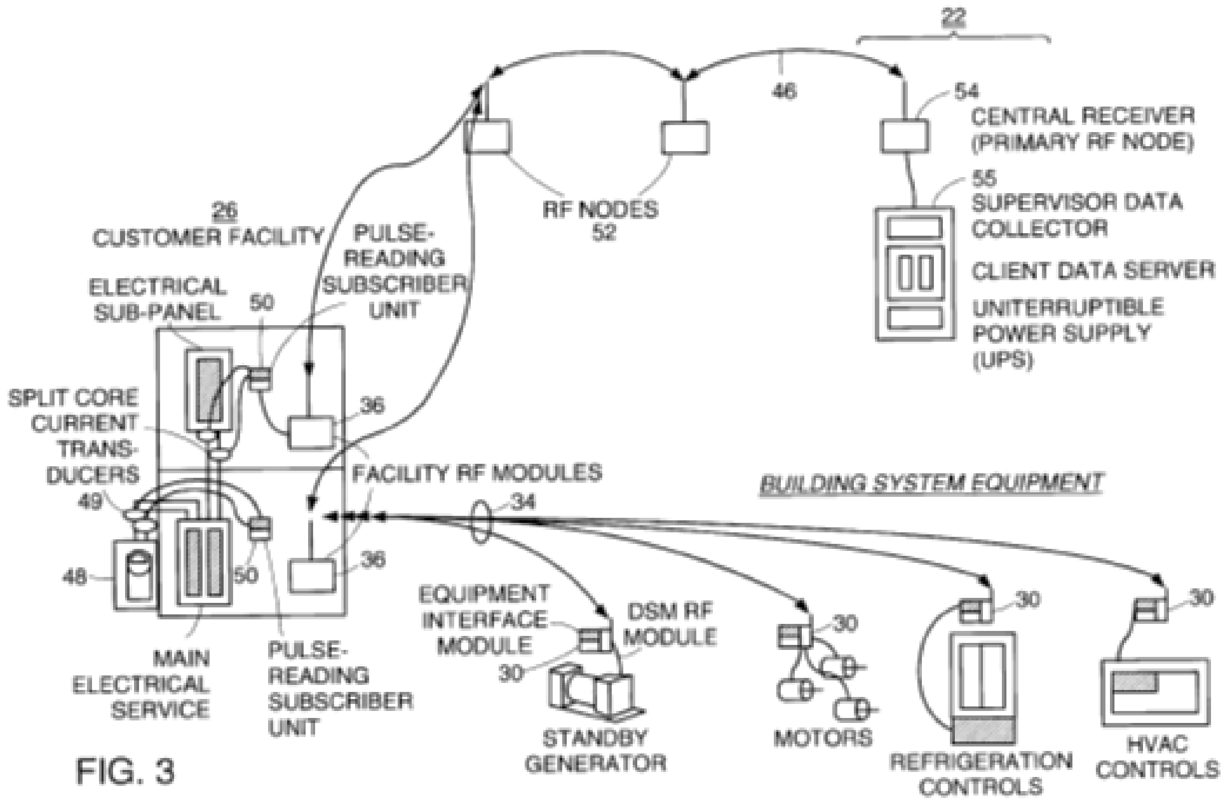


FIG. 3

ITR524-1007, Fig. 3. Bartone teaches, "control signals (not power) are provided to the local equipment controller to allow it to control the device 28." *Id.* 12:19-22. These device controllers "allow central monitoring and control of a large number of energy consumption devices on a real time basis." *Id.* 12:23-37. For example, monitoring real-time power consumption information allows the system to generate control signals to control air conditioning units: "Through central monitoring and control, energy savings based on the 'macro' picture are possible. For example, simply by limiting the activation of air conditioning units at several facilities for a few minutes can help keep a utility load below a preferred limit. As other air conditioning units are cycled off, the new units can be activated." *Id.* 12:27-33.

According to Dr. Akl, "the local equipment controller 30, which also measures power usage, receives and provides control signals to control the connected device, e.g., an air conditioning unit, based on real-time power consumption and load information." ITR524-1003, ¶ 230 (citing ITR524-1007, 12:19-22, 12:23-37).

x. Claim 21: [21B]: transmitting the control signal to an appliance; and controlling the appliance with the control signal.

This section incorporates the corresponding Suh disclosure for Limitation [21B] in Part XI.A, *supra*.

Bartone also discloses or renders obvious transmitting the control signal to an appliance and controlling the appliance with the control signal. *See* ITR524-1003, ¶¶ 231-33. For example, Bartone teaches device controllers that can both measure power consumption and control devices. *See* ITR524-1007, Fig. 3.

Bartone teaches that "control signals (not power) are provided to the local equipment controller to allow it to control the device 28." ITR524-1007, 12:20-22. These device controllers "allow central monitoring and control of a large number of energy consumption devices on a real time basis." *Id.* 12:23-25. For example, monitoring real-time power consumption information allows the system to generate control signals to control air conditioning units: "Through central monitoring and control, energy savings based on the 'macro' picture are possible. For example, simply by limiting the activation of air conditioning units at several facilities for a few minutes can help keep a utility load below a preferred limit. As other air conditioning units are cycled off, the new units can be activated." *Id.* 12:27-33.

According to Dr. Akl, "the local equipment controller 30, which also measures power usage, receives and transmits control signals to control the connected device, e.g., an air conditioning unit, based on real-time power consumption and load information." ITR524-1003, ¶ 233. Accordingly, the device controller receives and transmits control signals to devices, and the devices are controlled via those control signals.

xi. Claim 22: [22A]: The method of claim 21, wherein the step of controlling the appliance comprises turning the appliance off in response to increased power consumption.

This section incorporates the corresponding Suh disclosure for Limitation [22A] in Part XI.A, *supra*.

Bartone also discloses or renders obvious turning the appliance off in response to increased power consumption as part of the step of controlling the appliance. ITR524-1003, ¶¶ 234-37. For example, Bartone teaches using device controllers to control (including disabling) motors, refrigeration controls, and air conditioning units. *See* ITR524-1007, Fig. 3.

Bartone teaches that monitoring real-time power consumption information allows the system to generate control signals to control air conditioning units:

"Through central monitoring and control, energy savings based on the 'macro' picture are possible. For example, **simply by limiting the activation of air conditioning units** at several facilities for a few minutes can **help keep a utility load below a preferred limit**. **As other air conditioning units are cycled off, the new units can be activated.**" ITR524-1007, 12:27-33 (emphasis added).

According to Dr. Akl, "the local equipment controller cycles air conditioning units off to keep the utility load before a preferred level. Accordingly, in response to increased power consumption, appliances are turned off using the control signals taught by Bartone." ITR524-1003, ¶ 237. Accordingly, the device controller turns off an appliance in response to increased power consumption.

C. Count 3: Claims 17-22 are unpatentable under 35 U.S.C. §103(a) over Villicana in light of Bartone.

i. Motivation to Combine

Villicana and Bartone both teach utility meter systems that measure power consumption data and communicate over the Internet. ITR524-1007 at Abstract; ITR524-1008, at Abstract. Villicana, for example, provides a user with information, such as consumption, and based on received rate schedules, can provide a user with information related to current costs. Based on this information, the user of Villicana is able to reduce usage at her/his location based on real-time power consumption information.

A POSITA would have understood that such a user-driven system would potentially have the shortcoming of relying on a user to take manual action. To truly control consumption, the utility would want to have a system to remotely control such consumption. *See* ITR524-1007, 5:56-6:2, 6:18-23. Likewise, the user may also want the ability to provide remote control or automatic control on a real-time basis to take advantage of an incentivized price plan. *Id.* 6:59-7:3.

According to Dr. Akl:

> A POSITA would have been motivated to combine Villicana's system with Bartone's system to add the device controllers taught in Bartone in order to provide load management services, as suggested by Bartone, to allow control by the utility and/or the consumer to selectively reduce power consumption. Using the real-time power usage data, Villicana's system would have been able "to reduce energy consumption during costly peak times and reduce[] the price of competitive energy from competitive generation suppliers that possess fixed capacity levels." By adding the device controllers of Bartone in connection with the power consumption data of Villicana, the utility provider or utility customer could automatically manage energy usage to occur during non-peak-load times, which would reduce both the costs on the utility system and on the individual customer.

ITR524-1003, ¶ 242. Accordingly, there exists a teaching, suggestion, or motivation to combine Villicana with Bartone. *See also* ITR524-1003, ¶¶ 238-43.

Further, given that it is generally the utility that owns the power meter, a POSITA would have expected the utility to access or otherwise use the consumption data. According to Dr. Akl, "[a] POSITA would have been motivated to combine Villicana's system with Bartone's system to add the billing capabilities taught in Bartone because the reason most utility companies monitor power consumption data is to determine and calculate the amount of power their customers are using so that they can bill them." ITR524-1003, ¶ 238. Bartone teaches generating a bill based on the received power consumption information. ITR524-1007, 8:15-57.

Given that Villicana's and Bartone's systems are both related to energy monitoring, a POSITA would have expected success with the addition of Bartone's in-home control system given that it is simply an addition of known functionality to a similar metering system as taught by Villicana. Furthermore, a POSITA would have expected success in using the consumption data of Villicana in the billing system of Bartone, given that Villicana relies on standard power consumption measurements and known rate data. ITR524-1003, ¶¶ 238-43.

ii. Claim 17: [17 Pre] A method of measuring power consumption information on a power line comprising:

This section incorporates the corresponding Bartone disclosures for Limitation [17 Pre] in Part XI.B, *supra*.

Villicana also discloses or renders obvious a method of measuring power consumption information on a power line. *See* ITR524-1003, ¶ 246-47. For example:

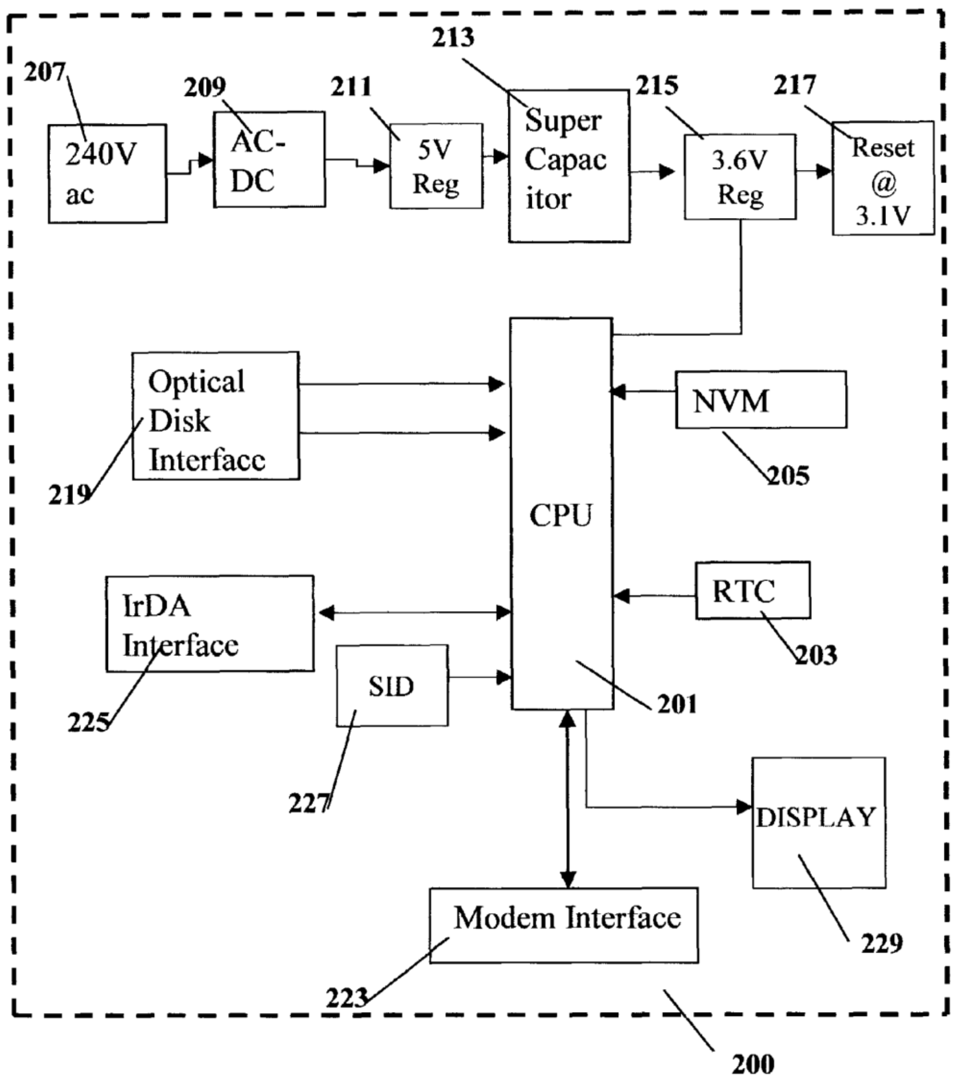


FIG. 2

ITR524-1008, Fig. 2. Villicana teaches, "To measure the consumption of electricity in residential applications, a utility company meter is provided at the electrical service entrance to the residence." ITR524-1008, 1:16-19. "The system measures residential energy consumption and automatically communicates this information to a host computer." *Id.* 1:64-66.

According to Dr. Akl, the electrical service entrance to the residence is a power line. ITR524-1003, ¶ 247. Accordingly, Villicana teaches that electricity meters are typically positioned at the energy service entrance to the residence (i.e., the power line) and that those meters measure power consumption information. *Id.*

iii. Claim 17: [17A] measuring current fluctuations in the power line and [17B] calculating power consumption information from the current fluctuations in a processor:

This section incorporates the corresponding Bartone disclosure for Limitations [17A] and [17B] in Part XI.B, *supra*.

Villicana also discloses or renders obvious measuring current fluctuations in the power line and calculating power consumption information from the current fluctuations in a processor. ITR524-1003, ¶¶ 250-51. For example: Villicana describes the various types of utility company electricity meters:

> The electromechanical and hybrid type meters are essentially an induction motor in which the moving element is a rotating disk. **The speed of rotation of the disk is directly proportional to the voltage applied and the amount of current flowing through the motor.** The

> phase displacement of the current, as well as **the magnitude of the current, is automatically taken into account by the meter, i.e., the power factor influences the speed of rotation of the disk. The result is that the disk rotates with a speed proportional to true power.** In the electromechanical type of meters, a register is used to register the number of revolutions, **and the gearing is arranged to be read directly in kilowatt-hours.**

ITR524-1008, 1:22-34 (emphasis added). Villicana also teaches, "A system in accordance with the invention utilizes a scalable architecture that **permits power usage data to be calculated** and stored incrementally for automatic transmission." *Id*. 2:47-49 (emphasis added). Such calculations are described above as including the calculation of power consumption information – kilowatt-hours. *Id*. 1:15-34, 2:47-52.

Villicana teaches that the utility meters in its preferred embodiment are each of the hybrid type described above, and include the rotating disk for measuring changing current to calculate power consumption. ITR524-1008, 1:15-34, 5:32-39. Villicana specifically considers the fluctuations of the current to influence the speed of rotation of the disk—a higher current over time registers as a higher power consumption, and a lower current over time registers as lower power consumption. ITR524-1008, 1:15-34. In the electric and hybrid meters, a programmable structure (which would include a processor) replaces the register from the electromechanical structure that calculates the kilowatt-hour usage information based on the measured current fluctuations. *Id.* 5:32-39. Villicana's systems therefore measure current fluctuations in a power line and calculate power usage or energy consumption based on those current fluctuations, which a POSITA would have understood is accomplished using the CPU in Fig. 2 using methods known in the art and described in the '524 APA. ITR524-1003, ¶ 251.

iv. Claim 17: [17C] converting the power consumption information into IP-based power consumption information in the processor:

This section incorporates the corresponding Bartone disclosure for Limitation [17C] in Part XI.B, *supra*.

Villicana also discloses or renders obvious converting the power consumption information into IP-based power consumption information in the processor. *See* ITR524-1003, ¶¶ 255-57. For example:

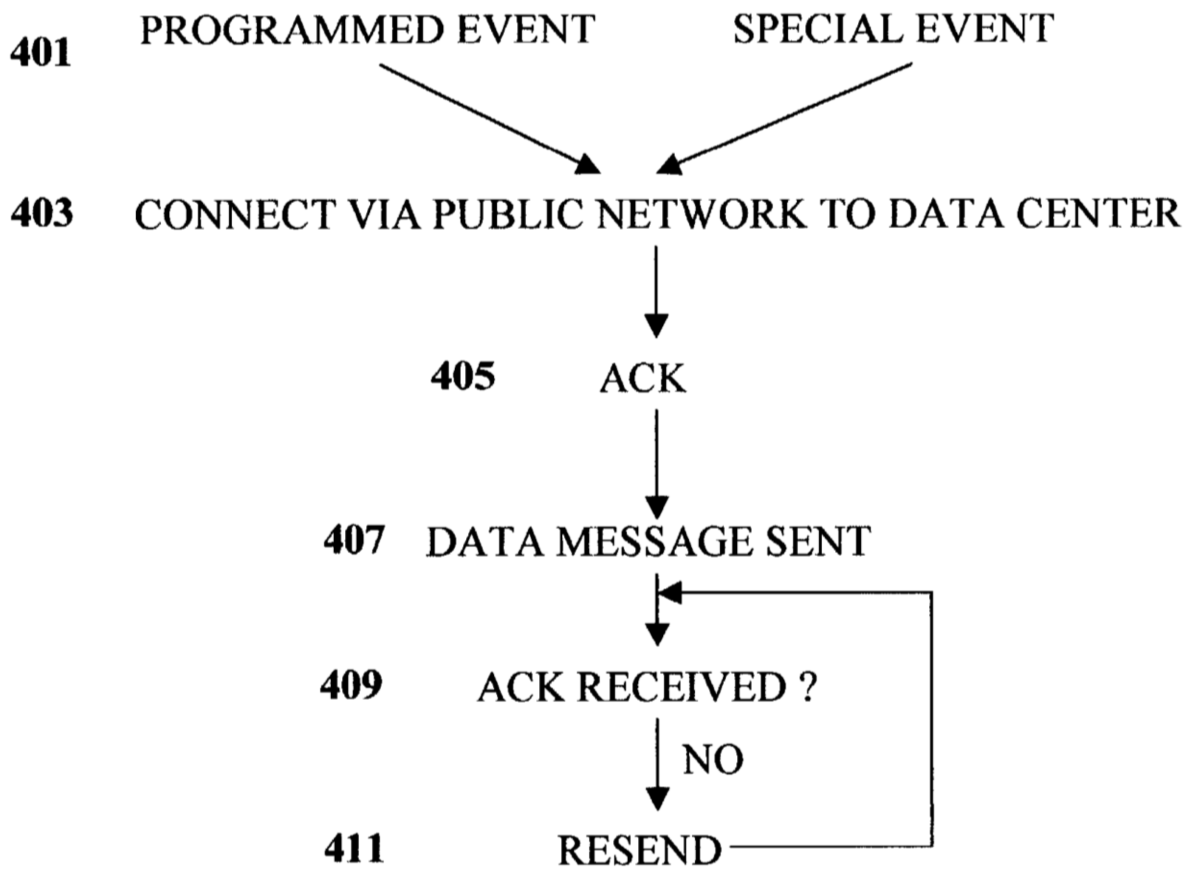


FIG. 4

ITR524-1008, Fig. 4. As Villicana states: "A system in accordance with the invention utilizes a scalable architecture that permits power usage data to be calculated and stored incrementally for automatic transmission." ITR524-1008, 2:47-49. "At step 401, controller 201 determines that it needs to connect to data center 103 via server 101. The determination is made either as a result of a regular programmed event such as a daily upload, or for a special event such as a loss of power." *Id.* 7:48-51. Villicana teaches that to transmit its periodic upload of power consumption data, it must "establish a TCP/IP connection" and send a message to the server over that connection with an "appropriate data message." *Id.* 7:52-62.

According to Dr. Akl, the disclosures in Villicana "indicate that the meters in Villicana convert the measured data to TCP/IP data in order to transmit that data over modem 203 to the server using a TCP/IP connection." ITR524-1003, ¶ 256.

v. Claim 17: [17D]: transmitting the IP-based power consumption information from the processor to a destination autonomously in IP format over an external power line network

This section incorporates the corresponding Bartone disclosure for Limitation [17D] in Part XI.B, *supra*.

Villicana also discloses or renders obvious transmitting the IP-based power consumption information from the processor to a destination autonomously in IP format over an external power line network. *See* ITR524-1003, ¶¶ 262-66. For example, Villicana teaches performing a "daily upload" of power usage data over a power line network using a TCP/IP connection:

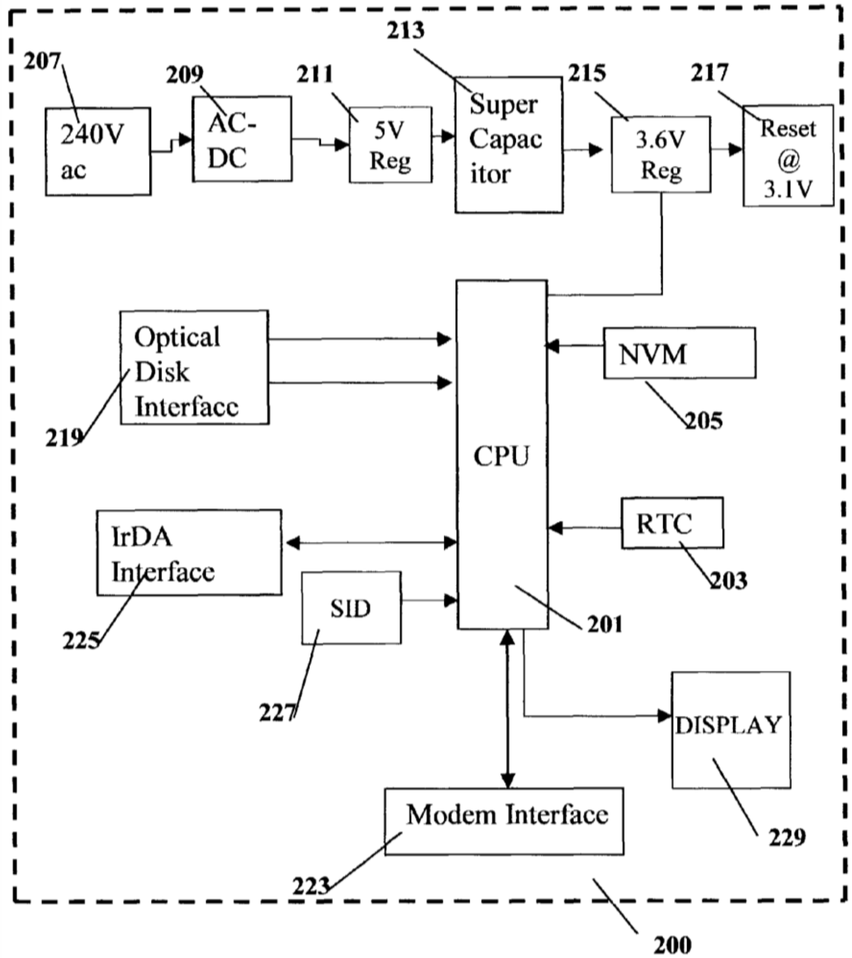


FIG. 2

ITR524-1008, Fig. 2.

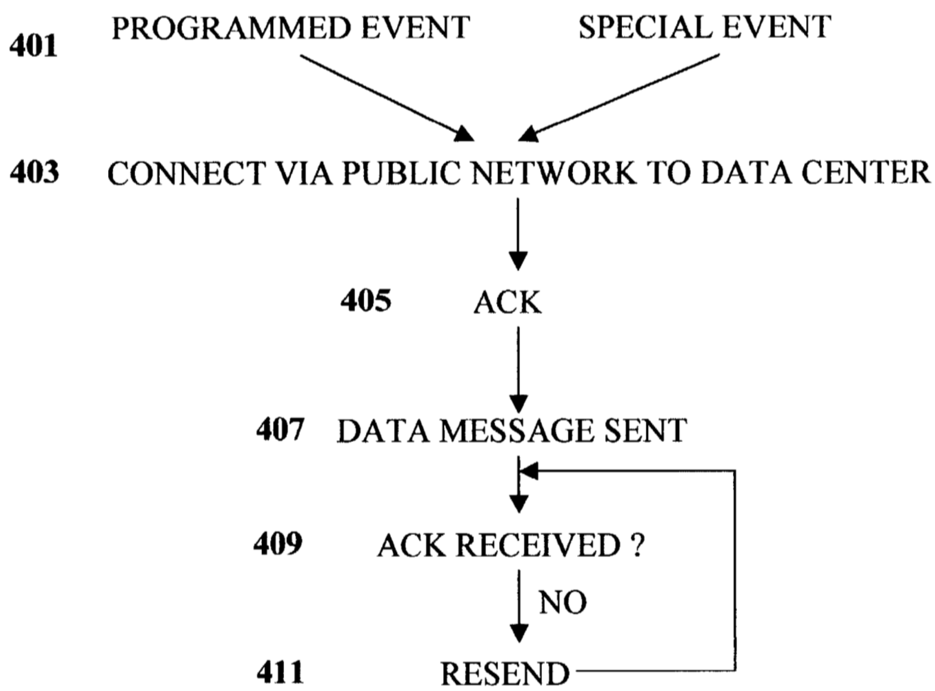


FIG. 4

ITR524-1008, Fig. 4. Villicana also states: "**Structure 200 also includes a wide area network interface 223 that provides one or more of** analog modem functionality, cellular telephone modem functionality, satellite communication functionality, 2 way paging functionality, or **power line carrier functionality.**" ITR524-1008, 6:17-21 (emphasis added). The wide area power line carrier network taught in Villicana would comprise an external power line network for communicating between the power meter and the utility providing the power.

Villicana further teaches that the controller determines by itself (*i.e.*, autonomously) that it needs to send data, for example, as part of a daily data upload or in response to a special event:

> At step 401, **controller 201 determines that it needs to connect to data center 103 via server 101.** The determination is made either as a result of **a regular programmed event such as a daily upload**, or for a special event such as a loss of power. **Controller 201 utilizes modem 223 to establish a TCP/IP connection** at step 403 to server 101. **Controller 201 via modem 223 sends a message to server 101 along with appropriate data message** at step 407. Server 101 acknowledges receipt of the data message at step 409.

ITR524-1008, 7:48-57 (emphasis added).

As disclosed above, the meters taught by Villicana **automatically upload** recorded energy usage data to the data server **on a daily basis**—for example, messages containing usage data are sent daily over a TCP/IP connection that is optionally implemented over a power line carrier. The recorded power usage information is sent in a message with TCP/IP headers attached and sent over an IP network (such as the Internet). The power usage information is therefore "IP-based" as used in the '524 Patent when transmitted to the remote destination. ITR524-1003, ¶¶ 262-66.

vi. Claim 18: [18A]: The method of claim 17, further comprising: receiving the IP-based power consumption information at the

destination; and calculating a utility bill using the IP-based power consumption information.

This section incorporates the corresponding Bartone disclosure for Limitation [18A] in Part XI.B, *supra*.

Villicana also discloses storing information related to rate schedules for each individual service residence/account, at the same location where the consumption information is transmitted. *See* ITR524-1008, 6:56-61. As detailed above in connection with Limitation [17D], the meters in Villicana also automatically upload IP-based energy consumption data to the data center on a daily basis. According to Dr. Akl, "[a] POSITA would have been motivated to combine Villicana's system with Bartone's system to add the billing capabilities taught in Bartone because most utility companies monitor power consumption data to determine and calculate the amount of power their customers are using so that they can bill them." ITR524-1003, ¶ 238.

Further, according to Dr. Akl:

> [A] POSITA would have been motivated to configure the system of Villicana to generate bills for customers in order to get bills out more quickly and to reduce human error in the reading of energy usage information and the calculation of utility bills. By getting the bills out more quickly, and by reducing their errors, a utility company would get paid in full more quickly. In fact, there is little point to storing the rate

information in data center 103 other than to automatically calculate the amount due as a result of the power consumed by the account.

ITR524-1003, ¶ 239.

vii. Claim 19: [19A]: The method of claim 17, further comprising transmitting the IP-based power consumption information over an IP-based network

This section incorporates the corresponding Bartone disclosure for Limitation [19A] in Part XI.B, *supra*.

Villicana also discloses or renders obvious transmitting the IP-based power consumption information over an IP-based network. *See* ITR524-1003, ¶¶ 277-78. For example:

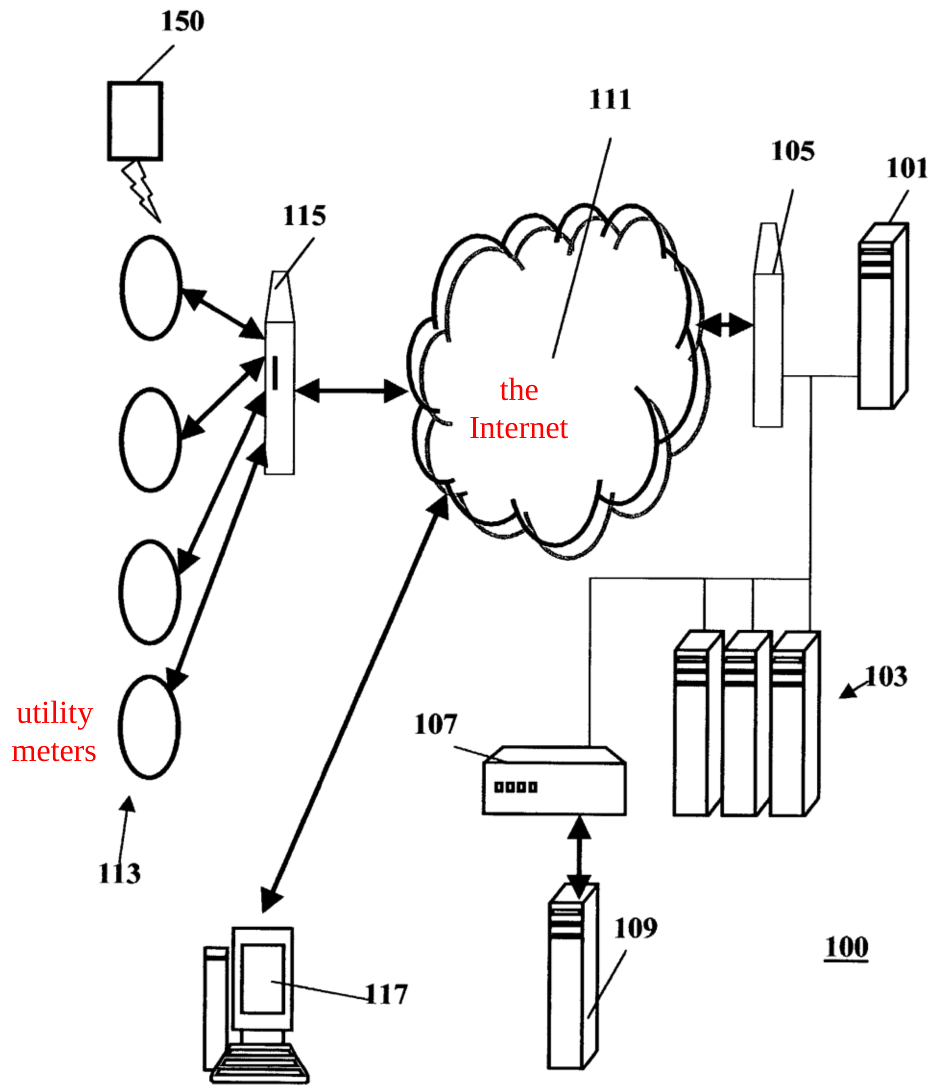


FIG. 1

ITR524-1008, Fig. 1 (red annotations added).

As illustrated in Fig. 1, Villicana teaches transmitting IP-based power consumption information from utility meters over the Internet. *See* ITR524-1008, 2:28-32; 4:37-39. Furthermore, the "[m]eter 113 includes an auto dialer that is under software control at the respective meter 113 to dialup **a connection via Internet 111**

to system 100 to upload power usage data from meter 113 to system 100 for storage in data center 103." *Id.* 5:15-19 (emphasis added). A POSITA would have understood that the Internet is an IP-based network. ITR524-1003, ¶ 278.

Accordingly, Villicana teaches transmitting IP-based power consumption information over an IP-based network, e.g., the Internet.

viii. Claim 20: [20A]: The method of claim 17, further comprising wirelessly transmitting the IP-based power consumption information from the processor to the destination.

This section incorporates the corresponding Bartone disclosure for Limitation [20A] in Part XI.B, *supra*, as well as the discussion of the proper interpretation of the scope of this dependent claim in Part XI.A, *supra*.

Villicana also discloses or renders obvious wirelessly transmitting the IP-based power consumption information from the processor to the destination. *See* ITR524-1003, ¶¶ 284-86. For example:

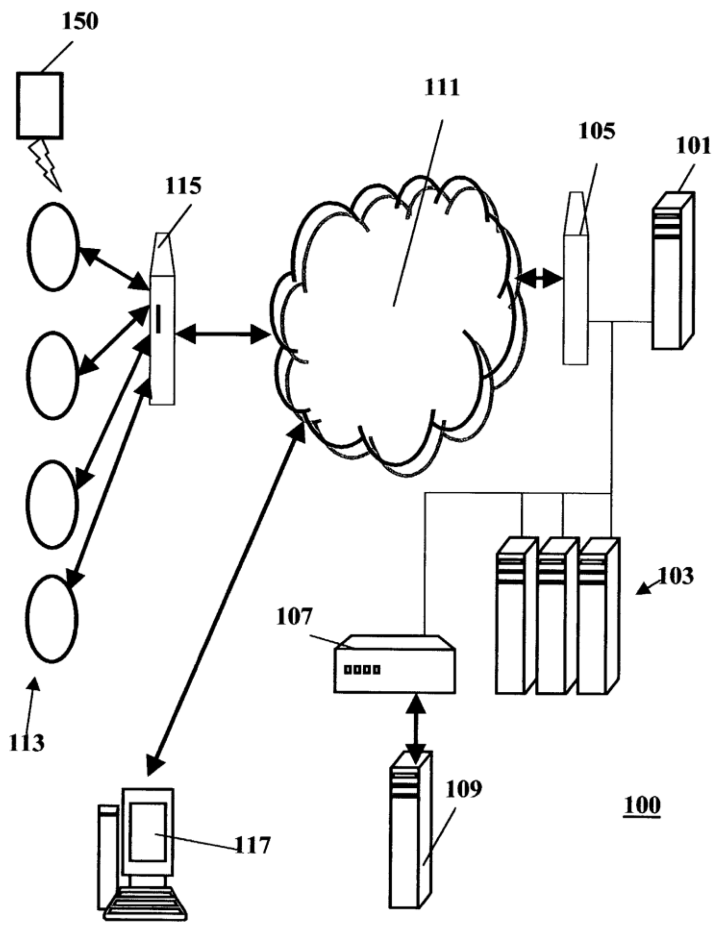


FIG. 1

ITR524-1008, Fig. 1.

Villicana teaches that the unit "**measures residential energy consumption** in predefined intervals, stores the measurements, **and communicates at predefined times to a host database server. The unit can accommodate various wired or wireless communication technologies through a simple communications port**." ITR524-1008, 2:4-11 (emphasis added). The public network in Villicana "**comprises the Internet** and the communications link includes **a telephone link**. **The telephone link comprises one or more of** a wired telephone line, **a wireless**

telephone line, a radio frequency communications link, and an optical link." *Id.* 3:21-25 (emphasis added). "**Structure 200 also includes a wide area network interface 223 that provides one or more of** analog modem functionality, **cellular telephone modem functionality, satellite communication functionality**, 2 way paging functionality, or power line carrier functionality." *Id.* 6:17-21 (emphasis added). Cellular telephone modem, wireless telephone line, radio frequency communications links, and satellite links all are methods of wireless transmission. ITR524-1003, ¶ 285. Accordingly, a POSITA would have understood that the power meters in Villicana measure residential energy consumption and transmit IP-based power consumption data wirelessly from the energy meter's processor to a destination, in addition to power line carrier transmission. ITR524-1003, ¶¶ 284-86.

Furthermore, a POSITA would have understood that wireless communication would have been obvious to use at other stages in the routing from the electric power meter to the destination, including IEEE 802.11 wireless routers used at the utility service providers' locations or microwave transmissions connecting a remote network of meters to the utility service provider. ITR524-1003, ¶ 286.

ix. Claim 21: [21A]: The method of claim 17, further comprising: generating a control signal in the processor in response to the power consumption information
[21B]: transmitting the control signal to an appliance; and controlling the appliance with the control signal.
Claim 22: [22A]: The method of claim 21, wherein the step of

controlling the appliance comprises turning the appliance off in response to increased power consumption.

This section incorporates the corresponding Bartone disclosure for Limitations [21A], [21B], and [22A] in Part XI.B, *supra*.

Villicana also teaches providing a user with information, such as power consumption, and can provide a user with information related to current costs, based on received rate schedules. Based on this information, the user of Villicana is able to manage and reduce power consumption at her/his location based on real-time power consumption information. ITR524-1008, 6:22-33.

As described above in connection with Part XI.C.i, a POSITA would have been motivated to combine the appliance controller technology of Bartone with the energy monitoring system taught by Villicana with the load management services and device controllers explicitly suggested by Bartone, and would have expected success in such combination. Part XI.C.i, *supra*.

Accordingly, a POSITA would have understood that the combination of Villicana's system with Bartone's in-home control system meets all the limitations of claims 21 and 22. ITR524-1003, ¶¶ 287-97.

D. <u>The Grounds Are Not Redundant</u>

There is no redundancy in this petition. Petitioner asks that each of the above grounds be independently instituted. *See Liberty Mutual Ins. Co. v. Progressive Cas. Ins. Co.*, CBM2012-00003, Paper 7, at 12 (PTAB Oct. 25, 2012). While two grounds rely on Suh, which discloses every element of the Challenged Claims, Count 2 is further based on Bartone, which further describes additional functionality of an autonomous Internet-based meter related to actions taken by a utility and the control of appliances. Count 3 does not rely on Suh and is instead based on Bartone and further based on Villicana.

XII. CONCLUSION

Petitioner asks that the Board institute *inter partes* review of U.S. Patent No. 7,058,524 and cancel the Challenged Claims.

Date: March 30, 2017

By: / Kirk T. Bradley /
Kirk T. Bradley (46,571)

CERTIFICATION UNDER 37 C.F.R. § 42.24

Under the provisions of 37 CFR § 42.24, the undersigned hereby certifies that the word count for the foregoing Petition for *inter partes* review totals 13,956 words, which is less than the 14,000 allowed under 37 CFR § 42.24(a)(i).

Date: March 30, 2017

By: / Kirk T. Bradley /
Kirk T. Bradley (46,571)

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e), 42.105, and the agreement of the parties, the undersigned hereby certifies service on the Patent Owner of a copy of this Petition and its respective exhibits via UPS Next Day Air to counsel for Smart Meter Technologies, Inc. at the correspondence address of record for the subject patent:

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