

Dish Network LLC, v. Entropic Communications, LLC
Case No.: IPR2024-00393
U.S. Patent No. 7,295,518

Patent Owner Demonstrative Slides

Monday, May 12, 2025
10:00 A.M. Eastern

Demonstrative Only - Not Evidence

Network Composition and Capability

- **The Petition Ignores The Coaxial Limitations of the '518 Patent**
 - The '518 Patent addresses a specific network topology
 - The '518 Patent claims a specific medium
- **The Petition Relies on Fundamentally Different Prior Art in Isaksson**
 - Isaksson is not analogous art
 - Isaksson cannot function in the claimed network

Demonstrative Only - Not Evidence PO-2

Technical Evidence of Record Not Before Board at Institution

1. Technical evidence now of record shows that a POSITA would not be motivated to modify Amit as Petitioner proposes
 - i. Technical expert confirms Petitioner's combinations frustrate "low cost" and "simple" goals of Amit (Ex. 2002, ¶¶ 100 – 102)
 - ii. Technical expert confirms Amit already solves the "problems" that motivate Petitioner's combinations (Ex. 2002, ¶¶ 82 – 94)
 - iii. Petitioner's expert confirmed he failed to consider or address drawbacks in complexity, cost, and incompatibility in Petitioner's combinations (Ex. 2009, 32:2-11)
2. Technical evidence now of record shows that a POSITA would not be motivated to modify Kliger as Petitioner proposes
 - i. Technical evidence confirms that a POSITA would not have been motivated to modify Kliger's fixed transmissions with Isaksson's variable constellation (Ex. 2002, ¶¶ 155 – 157)

Demonstrative Only - Not Evidence PO-3

Claimed Arrangement of the '518 Patent – Network Composition

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and
cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;
whereby network devices communicate with each other through the cable wiring using multi-carrier signaling;
wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

Ex. 1001, cl. 1; POR, 11

Signal splitters are commonly used in home and other building type coaxial cable wiring. They have an input port and multiple output ports. The input port can also be considered a common port. The output ports can also be considered tap ports. Splitters are generally passive devices

Ex. 1001, 1:53-57

Demonstrative Only - Not Evidence PO-4

Overview of the '518 Patent – Network Capability

- Solves for impairments present in home wiring that restrict high-bandwidth communication between devices within a home
- Transmits probe messages to estimate channel characteristics between network devices
- Solves multipath environment problems

a communication network. The signal reflections and tap port isolation of splitters existing in a typical cable TV wiring configuration presents a problem to shared usage of the cable for a LAN system. The prior art references address communicating between a cable head end and in-home units but do not address the impairments present in the home wiring that restricts high bandwidth communication between devices within the home.

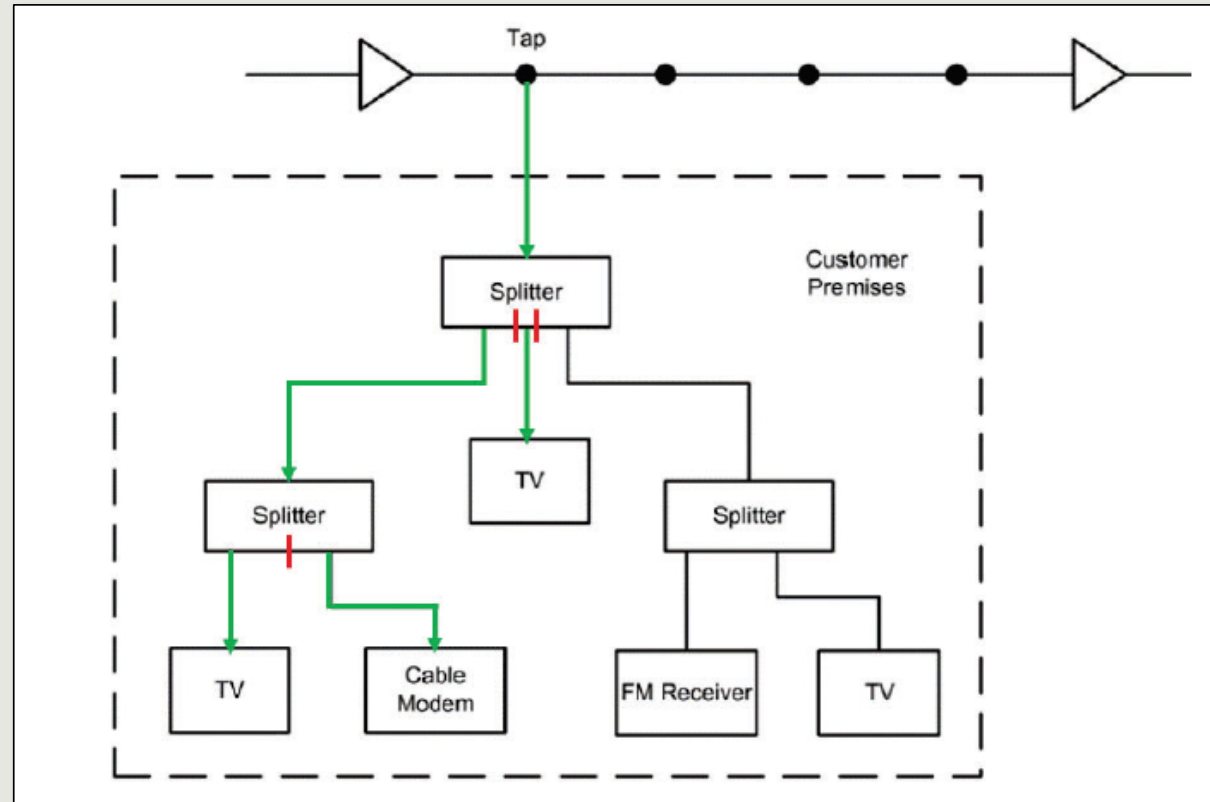
Ex. 1001, 4:25-32

In a conventional cable TV or cable modem use, this isolation is desirable because terminal devices do not communicate with each other, they only communicate through the POE with the cable head-end. In a LAN system, terminal devices must communicate directly with each other, therefore attenuation between tap ports in the signal splitters results in an undesirable signal loss. Presenting a further problem to terminal to terminal communications is the variation in attenuation in different branches of the building wiring. All terminal devices are not connected directly to the main splitter, but may be connected at a secondary splitter, for example in a room. The level of attenuation between different pairs of terminal devices needing to communicate may vary by 10 to 40 dB or more.

Ex. 1001, 2:35-48; POR, 9

Demonstrative Only - Not Evidence PO-5

Overview of the '518 Patent – Network Composition

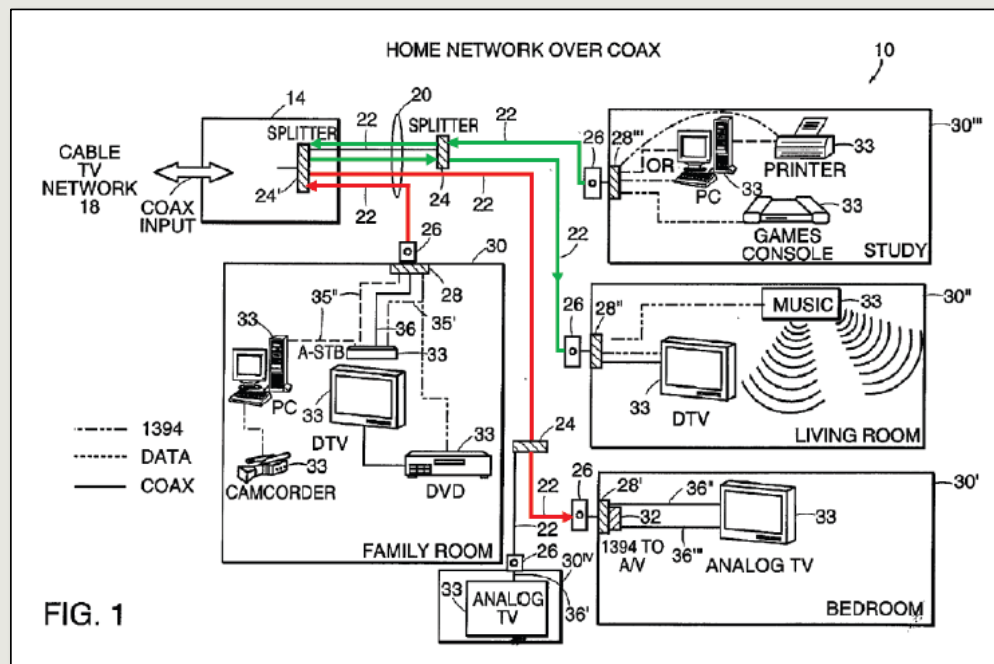


Ex. 1001, Fig. 1 (annotated in Ex. 2002, 47); POR, 8-9

Demonstrative Only - Not Evidence PO-6

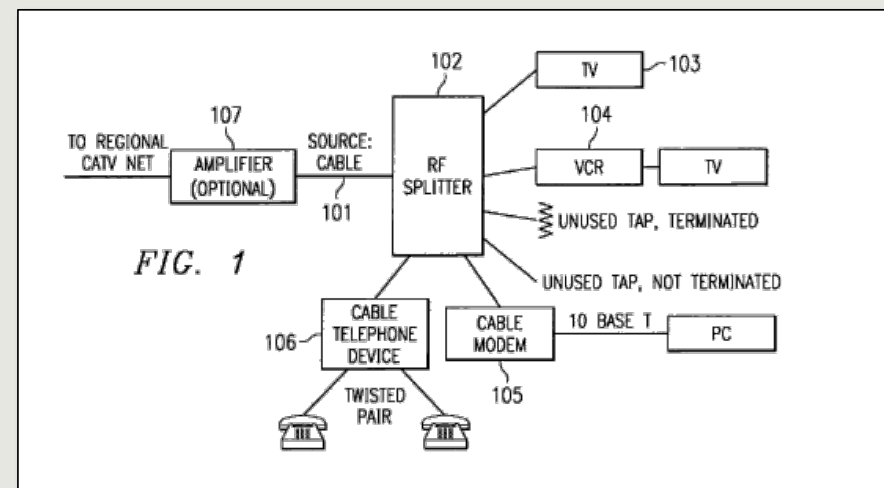
Overview of the “Coax References” – Network Capability

- *Kliger*



Ex. 1007, Fig. 1 (annotated in Ex. 2002, 155); POR, 62

- *Amit*

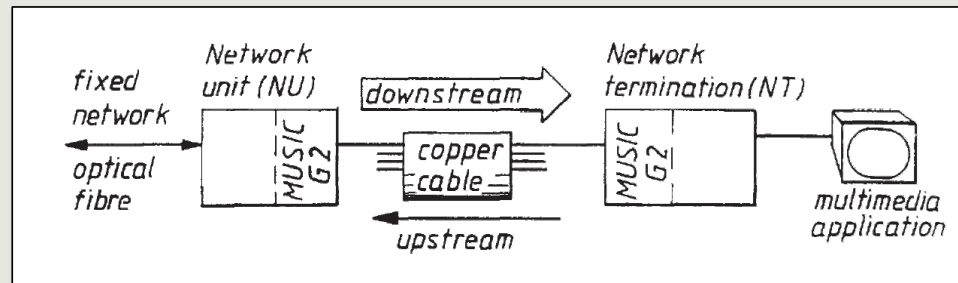


Ex. 1014, Fig. 1; POR, 26

Isaksson is 1-to-1 device receiver – Network Composition

151. Unlike Kliger, Isaksson transmits the base sync frames over its point-to-point architecture **without** an intermediary device. Ex. 1013 (Isaksson), 24:8-28, Fig. 1. Once the base sync frame is received, a reference frame is used to determine characteristics of the point-to-point channel the frame just traversed. Ex. 1013 (Isaksson), 10:10-14. A POSITA would have understood that, to function on Kliger's network, the base sync frame would need to determine characteristics of both the upstream channel to the HRU and the downstream channel to the receiving device.

Ex. 2002, ¶ 151.



Ex. 1013, Fig. 1

Channel characteristics may be estimated by periodic transmission, **by one of said transceivers**, of a base sync frame having a predetermined content and comparing, **in the other of said transceivers**, the received sync frame with a reference frame.

Ex. 1013, 10:10-14

Demonstrative Only - Not Evidence PO-8

Isaksson's Lack of Splitters – Network Composition

- *Isaksson's* system is specific to twisted pair as confirmed by the dozens of references to twisted pair and similar terms

A multi-carrier modulation technique, such as DMT, handles frequency dependent loss and noise in **twisted pair-cables** in an efficient manner.

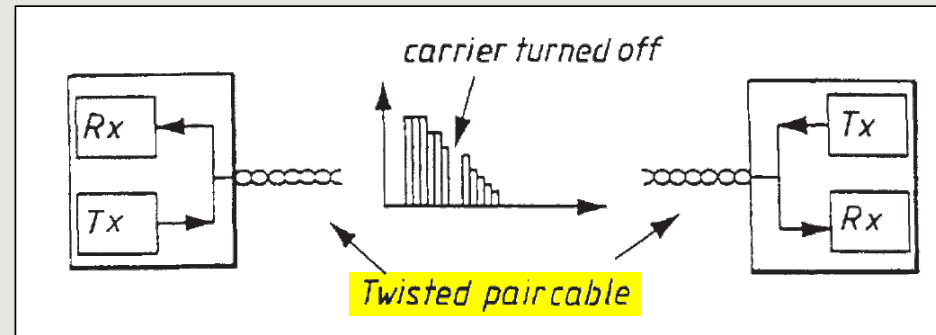
Ex. 1013, 26:4-6; PO-SR, 23; Ex. 2002, ¶ 60

The analog front end includes a hybrid transformer connected to an unshielded **twisted pair** and POTS. On

Ex. 1013, 27:14-15; PO-SR, 23; Ex. 2002, ¶ 60

The main source for timing in the system is the sample clock. The reference for the sample clock is situated on the NU side and is common to all **twisted copper pairs** within a secondary cable. The sample clock frequency is 20 MHz $\pm$ 10 ppm with a phase jitter of less than 0.5 ns.

Ex. 1013, 33:21-27; PO-SR, 23; Ex. 2002, ¶ 60



Ex. 1013, Fig. 2; PO-SR, 23; Ex. 2002, ¶ 60

**The Level of Ordinary Skill in the Art Requires Experience with
Coaxial Cabling**

Demonstrative Only - Not Evidence PO-10

The '518 Patent Is Specific to Coaxial Cables

BROADBAND NETWORK FOR COAXIAL CABLE USING MULTI-CARRIER MODULATION

(57) **ABSTRACT**

A broadband local area data network uses coaxial cable wiring for interconnection of terminal devices. Orthogonal frequency division multiplexing (OFDM) with bit loading is used to overcome channel impairments and provide a path for terminal devices to transmit to and receive from other terminal devices. Probe messages are sent between devices to characterize the communication channel and determine optimum bit loading. The data network shares the cable spectrum with other services and uses frequency bands not used by other services. Adaptive power control can be used to maintain signal to noise ratio in a communication between terminal devices. Frequency coordination can be used to avoid interference between the LAN communications and other services transmitted on the cable.

Ex. 1001, Title, Abstract; POR, 11-12

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and

cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;

whereby network devices communicate with each other through the cable wiring using multi-carrier signaling; wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

This invention relates to broadband communication networks and specifically to communications using coaxial cable building wiring.

Ex. 1001, cl.1, 1:25-30; POR, 11-12

Demonstrative Only - Not Evidence PO-11

Petition's Challenged Grounds

Ground	Claims	Basis
1	1, 3	§103: Kliger in view of Isaksson
2	1, 3	§103: Amit in view of Jacobsen and Isaksson

Petition, 3

Jacobsen Would Frustrate Amit's Goals
Ground 2

Demonstrative Only - Not Evidence PO-13

Amit Provides a Simple, Low-Cost Home Networking Solution

- Petitioner does not dispute *Amit*'s goal of providing a simple, low-cost home networking solution

a high bandwidth and it is shielded to avoid noise. The present invention provides a method and system which allows home networking over these coax cables, allowing for very high data rates and a low cost implementation. The

Ex. 1014, 2:53-56; POR, 32

cables. The disclosed system will allow very high-speed digital and analog communications within the home and from the home to external devices or networks using low cost devices.

Ex. 1014, 2:40-43; POR, 32

3. Must be low cost to allow the mass market to enjoy the benefits of home networking.

Ex. 1014, 18:33-34; POR, 32

Demonstrative Only - Not Evidence PO-14

New Evidence Post-Institution

Demonstrative Only - Not Evidence PO-15

PO's Expert Is The Only Testimony On Drawbacks Of Petition's Combinations

TECHNICAL ANALYSIS

- Mr. Garrett identified multiple technical drawbacks related to hardware costs, operational costs, and complexity that only hindsight would overlook
(Ex. 2002, ¶¶ 100 – 102)
- Dr. Williams failed to consider any disadvantages to the proposed combination
(Ex. 2009, 32:2-11; PO-SR, 7)

Demonstrative Only - Not Evidence PO-16

Jacobsen's Multi-Carrier Modulation Frustrates Amit's Goals

- Mr. Garrett's analysis is the only evidence of record concerning the disadvantages of adding *Jacobsen* to *Amit*

99. A POSITA would not have been motivated to use Jacobsen's multi-carrier modulation on Amit's network because Jacobsen's multi-carrier modulation contradicts Amit's goals of a low-cost and low-complexity network by adding hardware costs, operational costs, and complexity to Amit's network.

Ex. 2002, ¶ 99; POR, 33-35; PO-SR, 4-5

	Mr. Garrett	Dr. Williams
Hardware costs	Increase due to additional modulation hardware (Ex. 2002, ¶ 100)	Not Considered
Operational costs	Increase due to power consumption (Ex. 2002, ¶ 101)	Not Considered
Complexity	Increased due to redesigned algorithms and complexity in switch to multi-carrier modulation (Ex. 2002, ¶ 102)	Not Considered

Demonstrative Only - Not Evidence PO-17

Jacobsen Adds Hardware Costs

100. First, implementing multi-carrier modulation would add hardware costs to Amit's network. Amit's home networking device use single-carrier modulation. Ex. 1014 (Amit), 8:30-37 ("[T]he home networking device *must* provide QPSK and QAM 16."), 15:26-28 ("Home Networking Channel. The Home Networking channel (a **single channel** that is used for sending and receiving information)."); see Ex. 1004 (Williams Declaration), ¶ 172 (A "POSITA would have understood that Amit's modulation schemes are single-carrier modulation schemes.") (citing Ex. 1014 (Amit), 15:26-28). Additional hardware would be necessary to implement multi-carrier modulation that is not currently include in Amit's devices. For example, a POSITA would have understood that each one of Amit's home networking devices would require several additional hardware components to implement multi-carrier modulation. These would include multiplexers and demultiplexers, buffers, dedicated FFTs and inverse FFTs blocks, additional QAM constellation modulators and demodulators (1024-pt QAM), control blocks and memory for N (number of nodes) bit loading and gain-loading vectors. This additional hardware would increase the costs of each home networking device.

Ex. 2002, ¶ 100; POR, 33-34

Demonstrative Only - Not Evidence PO-18

Jacobsen Adds Operational Costs

101. Second, implementing multi-carrier modulation would add operational costs to Amit's network through increased power consumption. To implement multi-carrier modulation, the amplifier in the transmitter would consume more power. For example, in a single-carrier QAM system a Power Amplifier designed to transmit a maximum power out of 0dBm or 1mW with a 15 dB gain would need a 1dB compression point of -16dBm input because the signal has a very low Peak to average power (0dB) [Target output power – PAPR – Gain – 1dB compression point = 3dBm]. However, to use the same amplifier in a multicarrier system such as MoCA with 512 point FFT would require the input operational point of [Target Output Power – Gain - PAPR – 1dB compression] = -28 dBm resulting in an output power of -16dBm. To achieve a 0dBm output power for the multicarrier system requires a PA capable of 16dBm output power. That implies a power consumption increase of 30 times that of a single carrier system, which further implies higher cost of implementation and operation.

Ex. 2002, ¶ 101; POR, 34-35

Demonstrative Only - Not Evidence PO-19

Jacobsen Adds Complexity

102. Third, implementing multi-carrier modulation would add complexity to Amit's network. As introduced in paragraph 98, Amit uses single-carrier modulation. Multi-carrier modulation is more complex because it would require, for example, each of Amit's devices to efficiently implement (1) an implementation of the fast Fourier transform that is sufficient to achieve required timelines, a redesign and implementation of preamble and acquisition algorithms to achieve sufficient system parameter estimation to enable reliable reception, an increase in the size of the DAC and the ADC to achieve sufficient dynamic range to accommodate the digital peak to average power (typically an additional 2 to 3 bits), implementation of RF hardware to accommodate the dynamic range, invention of compensation algorithms not required for single-carrier QAM to compensate for the RF components system errors (frequency, jitter, compression, gain and phase imbalance) to enable reliable reception of OFDM waveforms).

Ex. 2002, ¶ 102; POR, 35-36

Demonstrative Only - Not Evidence PO-20

Any of Petitioner's Alleged Benefits Do Not Outweigh These Disadvantages

- Dr. Williams did not weigh the disadvantages of adding *Jacobsen*

A. I'm saying that I have not expressed the opinion that there are downsides, and I've not enumerated those downsides in my report.

Q. Do you have an opinion about whether or not there are downsides to the combinations that you proposed?

A. Not that I've expressed.

Q. I understand.

But do you have one?

A. Not at this time.

Ex. 2009, 32:2-11; PO-SR, 7

Demonstrative Only - Not Evidence PO-21

PO's Expert Is The Only Testimony On Drawbacks Of Petition's Combinations

TECHNICAL ANALYSIS

- Mr. Garrett identified multiple technical drawbacks related to hardware costs, operational costs, and complexity that only hindsight would overlook
(Ex. 2002, ¶¶ 100 – 102)
- Dr. Williams failed to consider any disadvantages to the proposed combination
(Ex. 2009, 32:2-11; PO-SR, 7)

Demonstrative Only - Not Evidence PO-22

**A POSITA Would Not Have Been Motivated to Combine *Jacobsen* and
Amit based on *Amit*'s "RF Challenges"
Ground 2**

Demonstrative Only - Not Evidence PO-23

Petitioner's Combination Theories - Riddled with Hindsight

NON-EXISTENT PROBLEMS

- Petitioner treats “high reflection” as a problem, but *Amit* already solves it and leverages it (*Ex. 1014, 14:1-6; POR, 30*)
- Petitioner treats “hidden node” as a problem, but its combination does nothing to solve it (*Ex. 2002, ¶ 91; POR, 28-30*)
- Petition treats “synchronization” as a need, but *Jacobsen* already had it (*Ex. 2002, ¶ 122; POR, 44*)

Demonstrative Only - Not Evidence PO-24

Amit's Uses High Reflections to Communicate

- Petitioner cites “high reflection” as a problem to be solved . . .

“houses where there is a problem with reflection” (*id.*, 20:42-43). Amit identifies “[t]he ‘hidden nodes’ problem” and “[h]igh reflection” as “some RF challenges in designing the HomeCN components.” *Id.*, 13:54-14:1.

Petition, 47; *POR*, 27

Demonstrative Only - Not Evidence PO-25

Amit's Transponder Module Addresses Reflections

- . . . and improperly ignores that *Amit* already solves that “problem”

In the Dual Frequencies Mode the Transponder module is required to be added in the entrance to the home. The signal from HCNU-2 is transferred to the transponder module. The transponder module changes the signal frequency from the US frequency to the DS frequency and transmits it to the home. The HCNU-3 received this signal with no echo.

The transponder is a simple one that translates the input frequency to another, whether if it is with an up and down conversion or other technique such as conversion to base-band and back.

The HCNU can support the two modes, and according to the configuration the operation mode will be specified. The configuration can be done manually or automatically by verifying if the transponder exists (by sending a signal in the US channel and verifying if the signal arrived in the DS channel).

Therefore this module can be inserted in houses where there is a problem with reflection.

There are some additional benefits in the two-frequency mode:

Ex. 1014, 20:26-43; Ex. 2002, ¶¶ 84-86; POR, 27-28

Demonstrative Only - Not Evidence PO-26

Amit's "Hidden Node" Issues are Unrelated to Jacobsen

- Petitioner cites “hidden nodes” as a problem to be solved . . .

“houses where there is a problem with reflection” (*id.*, 20:42-43). Amit identifies “[t]he ‘hidden nodes’ problem” and “[h]igh reflection” as “some RF challenges in designing the HomeCN components.” *Id.*, 13:54-14:1.

Petition, 47; POR, 28-30

Demonstrative Only - Not Evidence PO-27

Amit's "Hidden Node" Issues are Unrelated to Jacobsen

- . . . but fails to provide any explanation as to how *Jacobsen* would address this issue

91. A POSITA would not have been motivated to add Jacobsen's multi-carrier modulation to Amit's in-home network to solve Amit's hidden node problem because Jacobsen's multi-carrier modulation would do nothing to solve Amit's hidden node problem. Because Jacobsen's multi-carrier modulation would not solve Amit's hidden node problem, Amit's hidden node problem would not have motivated a POSITA to combine Amit and Jacobsen as Dr. Williams contends.

Ex. 2002, ¶ 91; POR, 28-30

Demonstrative Only - Not Evidence PO-28

Amit's Transponder Module Addresses Reflections

- Petitioner plucks out a “problem” with reflection to justify its combination . . .

Starting with the Amit-Jacobsen combination, a POSITA seeking to implement Amit's coaxial network would have understood that although “coax cable is an excellent communication medium” (DISH-1014, 2:51-53), there can be “houses where there is a problem with reflection” (*id.*, 20:42-43). Amit identifies

Petition, 47; POR, 27-28; PO-SR, 8-10

Demonstrative Only - Not Evidence PO-29

Amit's Uses High Reflections to Communicate

- . . . and improperly ignores that *Amit* leverages this reflection to improve communication

High reflection

The reflection from the notch filter is in the power of the signal or it might be higher. When this reflection is higher than the signal we can use this reflection as our main signal.

Ex. 1014, 14:1-6; POR, 30

Demonstrative Only - Not Evidence PO-30

Petitioner's Combination Theories - Riddled with Hindsight

NON-EXISTENT PROBLEMS

- Petitioner treats “high reflection” as a problem, but *Amit* already solves it and leverages it (*Ex. 1014, 14:1-6; POR, 30*)
- Petitioner treats “hidden node” as a problem, but its combination does nothing to solve it (*Ex. 2002, ¶ 91; POR, 28-30*)
- Petition treats “synchronization” as a need, but *Jacobsen* already had it (*Ex. 2002, ¶ 122; POR, 44*)

Demonstrative Only - Not Evidence PO-31

**A POSITA Would Not Have Been Motivated to Combine *Kliger's* Fixed
Transmissions with *Isaksson's* Variable Constellation
Ground 1**

Demonstrative Only - Not Evidence PO-32

Kliger Uses Fixed-Constellation Transmissions

- *Kliger* uses a fixed constellation

[0099] The data 206 carries the QAM symbol data. The constellation is the same for each HNM 28 (when transmitting), except when the HNM 28 is transmitting a registration burst. (Registration bursts are always QPSK, which is the default constellation size for new HNMs 28 requesting to join the home network 10.)

Ex. 1007, ¶ [0099]; POR, 61; Ex. 2002, ¶ 157

- *Isaksson* adjusts its number of transmitted bits

In systems that use bit-loading techniques, the number of transmitted bits per symbol is adapted, or regulated, to the signal-to-noise ratio (SNR) of the current carrier wave. This regulation dynamically affects, in time, the total bandwidth of the system. This variation in bandwidth leads to an absolute system requirement for synchronous configuration of the transmitter and the receiver, in terms of the number of coded/decoded bits per symbol and carrier wave. If this requirement is not met, the system will be unable to maintain a connection.

Ex. 1013, 3:26-34; POR, 17-18, 62; Ex. 2002, ¶ 156

Demonstrative Only - Not Evidence PO-33

New Technical Evidence Confirms *Isaksson* Would Not Motivate a Change to *Kliger*

A POSITA would not implement *Isaksson*'s variable-constellation transmissions in *Kliger*'s fixed constellation system

156. Isaksson dynamically changes the number of bits for each carrier wave over a single hop without communicating over splitters. Ex. 1013 (Isaksson), 3:24-27. Figure 36 of Isaksson illustrates a channel in a fully configured system. Ex.

transmission. This is made possible in Isaksson because its system analyzes a channel over a single point-to-point connection, which does not include splitters or intervening devices that divide the signal.

Ex. 2002, ¶ 156; POR, 60-63

Demonstrative Only - Not Evidence PO-34

New Technical Evidence Confirms *Isaksson* Would Not Motivate a Change to *Kliger*

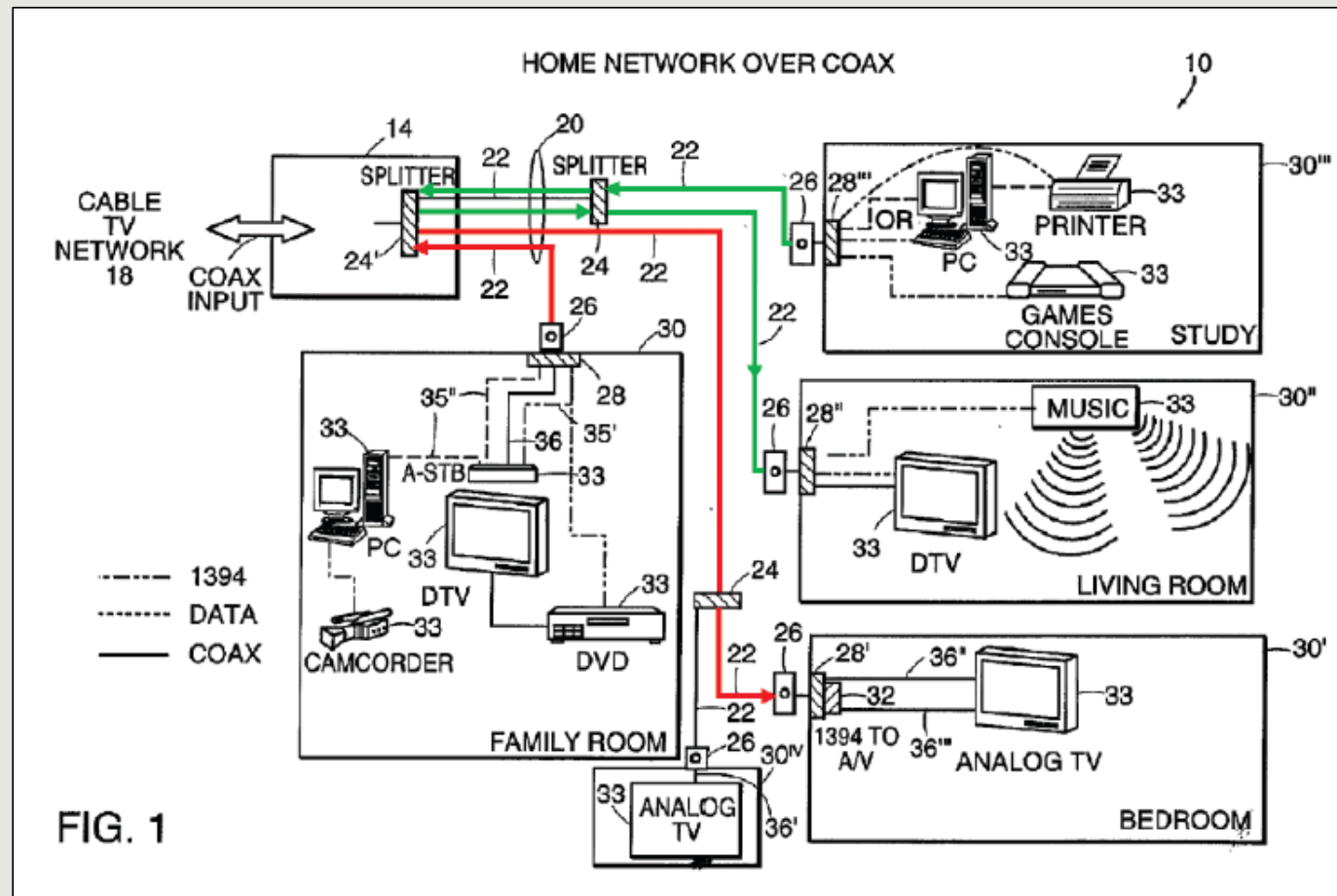
A POSITA would not implement *Isaksson*'s variable-constellation transmissions in *Kliger*'s fixed constellation system

157. Replacing Kliger's method of transmitting using the same constellation size with Isaksson's base sync frames would require such a change to Kliger that a POSITA would not be motivated to look to Isaksson. Specifically, the combination of Kliger and Isaksson contradicts Kliger's transmission of bursts that use a fixed constellation size depending on the network characteristics. Ex. 1007 (Kliger), ¶

Ex. 2002, ¶ 156; POR, 60-63

Demonstrative Only - Not Evidence PO-35

Kliger's Network Topology



Ex. 1007, Fig. 1 (annotated in Ex. 2002, 155); POR, 62; Ex. 2002, ¶ 155

Demonstrative Only - Not Evidence PO-36

The '518 Patent Adjusts Its Bit-loading

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and
cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;
whereby network devices communicate with each other through the cable wiring using multi-carrier signaling;
wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

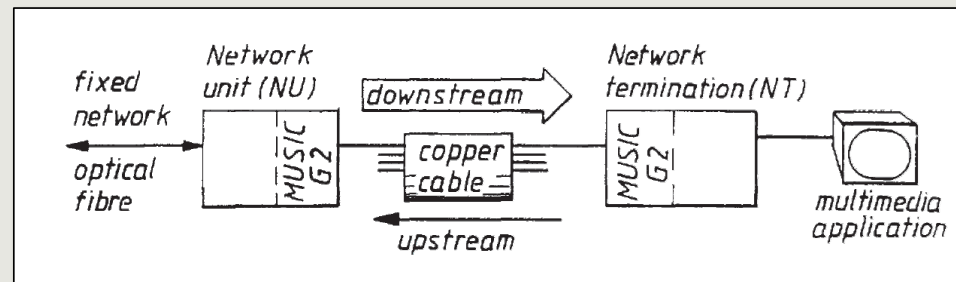
Ex. 1001, cl. 1; POR, 11

Demonstrative Only - Not Evidence PO-37

Isaksson is a Point-To-Point Network

151. Unlike Kliger, Isaksson transmits the base sync frames over its point-to-point architecture **without** an intermediary device. Ex. 1013 (Isaksson), 24:8-28, Fig. 1. Once the base sync frame is received, a reference frame is used to determine characteristics of the point-to-point channel the frame just traversed. Ex. 1013 (Isaksson), 10:10-14. A POSITA would have understood that, to function on Kliger's network, the base sync frame would need to determine characteristics of both the upstream channel to the HRU and the downstream channel to the receiving device.

Ex. 2002, ¶ 151.



Ex. 1013, Fig. 1

Ground No. 2
Amit, Jacobsen, and Isaksson – Section 103

Demonstrative Only - Not Evidence PO-39

Jacobsen already provides the Petition's Sole Motivation to Further add
Isaksson

Demonstrative Only - Not Evidence PO-40

Jacobsen Already Provides Synchronized Bit-Loading

- *Jacobsen* transmits “required information” on an overhead channel

interferers such as ham radio signals. Because the bit distribution is continuously updated during transmission as the receiver sends the required information to the transmitter on secure overhead channels, even severe and unpredictable interference like ham can be tolerated by a multicarrier system.

Ex. 1016, 10; POR, 44

- This “required information” allows for synchronized bit-loading

122. *Jacobsen* explains that “bit distribution is continuously updated during transmission as the receiver sends the required information to the transmitter on secure overhead channels.” *Ex. 1016 (Jacobsen), 10.* A POSITA would have understood that this “required information” to include the number of bits, allowing the transmitter to synchronize with the receiver. A POSITA would have understood that the “required information” includes the number of bits because if the “required information” did not include the number of bits, *Jacobsen* would not be able to maintain a connection. *Isaksson* also discloses this basic principle that a transmitter and receiver must communicate regarding the number of transmitted bits. When the number of transmitted bits change, the transmitter and receiver must be synchronized; “[i]f this requirement is not met, the system will be unable to maintain a connection.” *Ex. 1013 (Isaksson), 3:29-34 (“This variation in bandwidth leads to*

Ex. 2002, ¶ 122; POR, 44

Demonstrative Only - Not Evidence PO-41

Petitioner's New Theory is Improper

Demonstrative Only - Not Evidence PO-42

Petitioner Introduces a New Theory Regarding Transmitting Base Sync Frames – Ground 2

- The Petitioner's original theory

In the Amit-Jacobsen-Isaksson combination, Amit-Jacobsen's HCN devices would determine each carrier's channel characteristics to select the bit-loading.

Each HCN device—as a transmitter—would transmit base sync frames having predetermined content to the other HCN devices over respective channels.

Petition, 52; PO-SR, 11-12

- The Petitioner's new theory

PO also argues that Isaksson's base sync frames could not function in the Amit-Jacobsen system because Isaksson requires a control channel. POR, 37-39. This argument also fails. Dr. Williams explains that communication systems require a mechanism for control signaling. DISH-1036, ¶76. Rather than bodily incorporate Isaksson's control channel as PO contends, a POSITA implementing Isaksson's base sync frames in the Amit-Jacobsen system would do so using Amit's control signaling mechanism. A POSITA would recognize that Amit's IEEE 802.11 CSMA/CA protocol uses management frames for control messaging. DISH-1038, 606-609. As Dr. Williams confirms, a POSITA would have used these management frames to implement base sync frames. DISH-1036, ¶77.

Reply, 19; PO-SR, 11-12

Demonstrative Only - Not Evidence PO-43

Petitioner Also Relies on This New Theory in Ground 1

- The Petitioner's original theory

Accordingly, Kliger's HNMs would determine each carrier's characteristics to determine that carrier's number of bits. To do so, each Kliger HNM—as a transmitter—would transmit base sync frames having predetermined content to the other HNMs over respective channels between the HNMs. The other HNMs—as receivers—would analyze the received base sync frames to determine channel characteristics of the respective channels. The transmitter HNM would obtain information about the channel characteristics, *e.g.*, SNR, from the receiver HNMs and select the bit-loading parameters for the respective channels based on the received information. The transmitter HNM would then communicate the bit-loading parameters to the receiver HNMs. DISH-1004, ¶74.

Petition, 26; PO-SR, 14

- The Petitioner's new theory

contest this point. *Second*, Petitioner has established that a POSITA implementing Isaksson's methodology in Kliger's system would have implemented base sync frames (which are control messages) using Kliger's mechanism for control signaling. *Id.*, ¶90.

Reply, 25-26; PO-SR, 14

Demonstrative Only - Not Evidence PO-44

***Isaksson* is Not Analogous Art**

Demonstrative Only - Not Evidence PO-45

***Isaksson* is Not Reasonably Pertinent to the Problems that the '518
Patent Addresses**

Demonstrative Only - Not Evidence PO-46

The '518 Patent Addresses Impairments Specific to an In-Home Network

The present invention uses a form of multi-carrier modulation, orthogonal frequency division multiplex (OFDM), to transmit digital data signals through the coaxial cable wiring installed in homes. Communication is achieved through splitters and signal impairments caused by reflections and attenuation are overcome. Bit loading, along with power loading, adaptive power control, and frequency coordination can be used individually or in combination to implement a network that overcomes the problem of multipath and high attenuation in building cable wiring that would restrict the ability of terminal devices to communicate with each other.

Ex. 1001, 4:36-46; POR, 4

the cable for a LAN system. The prior art references address communicating between a cable head end and in-home units but do not address the impairments present in the home wiring that restricts high bandwidth communication between devices within the home.

Ex. 1001, 4:28-33; POR, 1

Demonstrative Only - Not Evidence PO-47

The '518 Patent Addresses Impairments Specific to an In-Home Network

In a conventional cable TV or cable modem use, this isolation is desirable because terminal devices do not communicate with each other, they only communicate through the POE with the cable head-end. In a LAN system, terminal devices must communicate directly with each other, therefore attenuation between tap ports in the signal splitters results in an undesirable signal loss. Presenting a further problem to terminal to terminal communications is the variation in attenuation in different branches of the building wiring. All terminal devices are not connected directly to the main splitter, but may be connected at a secondary splitter, for example in a room. The level of attenuation between different pairs of terminal devices needing to communicate may vary by 10 to 40 dB or more.

Ex. 1001, 2:35-48; POR, 9

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and
cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;
whereby network devices communicate with each other through the cable wiring using multi-carrier signaling; wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

Ex. 1001, cl. 1; PO-SR, 18

Demonstrative Only - Not Evidence PO-48

Isaksson Does Not Communicate Over Splitter Tap Ports

- Petitioner and Dr. Williams conflate a POTS splitter with the claimed splitters

Q. Do you know how that splitter determines what signal to send where?

A. It's frequency division.

Q. What does that mean?

A. It divides the incoming -- just like we talked about splitters earlier, it divides the incoming spectrum from the left side of that POTS splitter that's shown on the right, divides it into two different spectrums, one that goes to the top port and one that goes to the bottom port.

Q. So a portion of the spectrum will come out one port, and a different portion of the spectrum will come out a different port?

A. Yes. And you could subsequently stack other

Ex. 2009, 46:20-47:8; PO-SR, 19

configuration for a home is shown in FIG. 1. Signal splitters are used to distribute downstream signals from the point of entry (POE) to the various terminals in the home, which can include cable converter boxes, televisions, and cable modems, generally referred to as customer premise equipment (CPE). Each terminal device may have the ability to

Ex. 1001, 1:40-45; PO-SR, 19

A splitter may have 3 or more tap ports. There is typically an N-way splitter at the point of entry of a building that distributes the incoming CATV signal to each room of the building. The N-way splitter also combines the signals from

Ex. 1001, 2:11-14; PO-SR, 19

Demonstrative Only - Not Evidence PO-49

The '518 Patent and *Isaksson* Are From Different Fields of Endeavors

Demonstrative Only - Not Evidence PO-50

The '518 Patent Is Specific to Coaxial Cables

- The entirety of the '518 Patent is directed to coaxial cabling

BROADBAND NETWORK FOR COAXIAL CABLE USING MULTI-CARRIER MODULATION

(57) ABSTRACT

A broadband local area data network uses coaxial cable wiring for interconnection of terminal devices. Orthogonal frequency division multiplexing (OFDM) with bit loading is used to overcome channel impairments and provide a path for terminal devices to transmit to and receive from other terminal devices. Probe messages are sent between devices to characterize the communication channel and determine optimum bit loading. The data network shares the cable spectrum with other services and uses frequency bands not used by other services. Adaptive power control can be used to maintain signal to noise ratio in a communication between terminal devices. Frequency coordination can be used to avoid interference between the LAN communications and other services transmitted on the cable.

Ex. 1001, Title, Abstract; POR, 20-22

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and
cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;
whereby network devices communicate with each other through the cable wiring using multi-carrier signaling; wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

This invention relates to broadband communication networks and specifically to communications using coaxial cable building wiring.

Ex. 1001, cl.1, 1:25-30; POR, 20-22

Demonstrative Only - Not Evidence PO-51

The '518 Patent Is Specific to Coaxial Cables

- Dr. Williams testified that the '518 Patent's field of endeavor is specific to coaxial cabling

Q. What is the field of endeavor of the '518 patent?

A. Wired network systems using coaxial cables.

Ex. 2003, 76:25-77:2; POR, 20

184. **First**, each of Amit, Isaksson, and Jacobsen are in the same field of endeavor as the '518 patent (i.e., wired networking systems using coaxial cables).

See DISH-1001, Abstract; DISH-1013, 1:9-17; DISH-1014, 1:9-12; DISH-1016,

305. **Second**, Amit, Isaksson, and Jacobsen are reasonably pertinent to the

Ex. 1004, ¶184; POR, 20

Demonstrative Only - Not Evidence PO-52

Isaksson's Field of Endeavor is Not Coaxial Cabling

- *Isaksson's* system is specific to twisted pair as confirmed by the dozens of references to twisted pair and similar terms

A multi-carrier modulation technique, such as DMT, handles frequency dependent loss and noise in **twisted pair-cables** in an efficient manner.

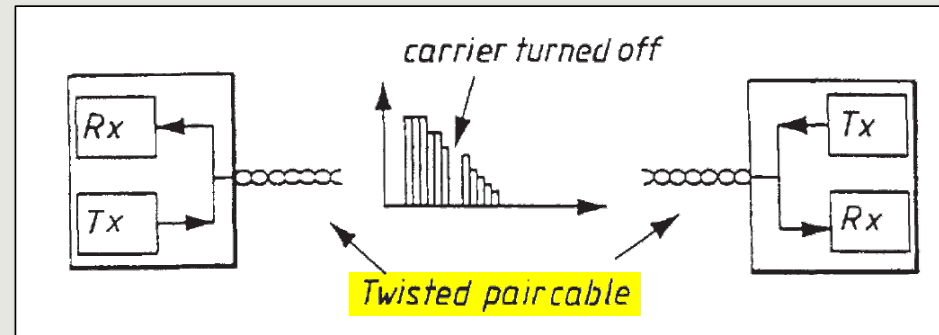
Ex. 1013, 26:4-6; PO-SR, 23; Ex. 2002, ¶ 60

The analog front end includes a hybrid transformer connected to an unshielded **twisted pair** and POTS. On

Ex. 1013, 27:14-15; PO-SR, 23; Ex. 2002, ¶ 60

The main source for timing in the system is the sample clock. The reference for the sample clock is situated on the NU side and is common to all **twisted copper pairs** within a secondary cable. The sample clock frequency is 20 MHz $\pm$ 10 ppm with a phase jitter of less than 0.5 ns.

Ex. 1013, 33:21-27; PO-SR, 23; Ex. 2002, ¶ 60



Ex. 1013, Fig. 2; PO-SR, 23; Ex. 2002, ¶ 60

The Petition Failed to Establish *Jacobsen* as Prior Art

Demonstrative Only - Not Evidence PO-54

Jacobsen is not prior art

- Munford is not a POSITA

Q. What is a POSITA?

A. POSITA is a phrase commonly used in this type of work that stands for Person of Ordinary Skill in the Art.

...

Q. And do you know what the given subject in this proceeding is?

A. Not without speculating.

Q. Do you know the educational level attained by a POSITA in this proceeding?

A. I do not.

Q. Do you know what kind of work experience a POSITA in this proceeding would have had?

A. I do not, without speculating.

Ex. 2010, 10:5-8; 10:13-22; PO-SR, 13

- Prior art status is based on whether a POSITA can identify and locate the reference.
- *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016).
- *In re Wyer*, 655 F.2d 221, 227 (CCPA 1981).

Demonstrative Only - Not Evidence PO-55

Jacobsen is not prior art

My understanding is the way that this goes is, a user moves their cursor through the field that they want to put the data into for that given field.

And so when you're entering a date, for example, into the 008 field, you go click on it and then type in the date. When you're entering something into, for example, the 005 field, you go click on it and enter whatever data goes into that.

So is there anything specific about the 008 field that sets it apart from any of the other fields?

A. I don't believe that your description of the process is incorrect.

Ex. 2010, 22:7-21; PO-SR, 13

Q. And so looking at that MARC record for the National Geographic magazine, there's no way to identify when the March 2025 edition of the National Geographic magazine was received by that library.

Is that right?

A. The MARC record does not tell us explicitly when a given issue of the periodical is made available.

Ex. 2010, 25:23-26:7; PO-SR, 13

Demonstrative Only - Not Evidence PO-56

Jacobsen is not prior art

Q. And the data creation of that MARC record would be the first time that the creating library received a volume of the National Geographic magazine, right?

A. That is a possibility.

It is also a possibility that the record gets created prior to formal publication and perhaps at the onset of a subscription to the periodical in question.

Q. And so assuming that a library has been receiving the National Geographic for ten years, when the March 2025 volume of the National Geographic magazine comes in, it would not get a new version of -- or a new MARC record for that March 2025 edition, right?

A. Correct. Unless there was something unusual or remarkable about that specific issue.

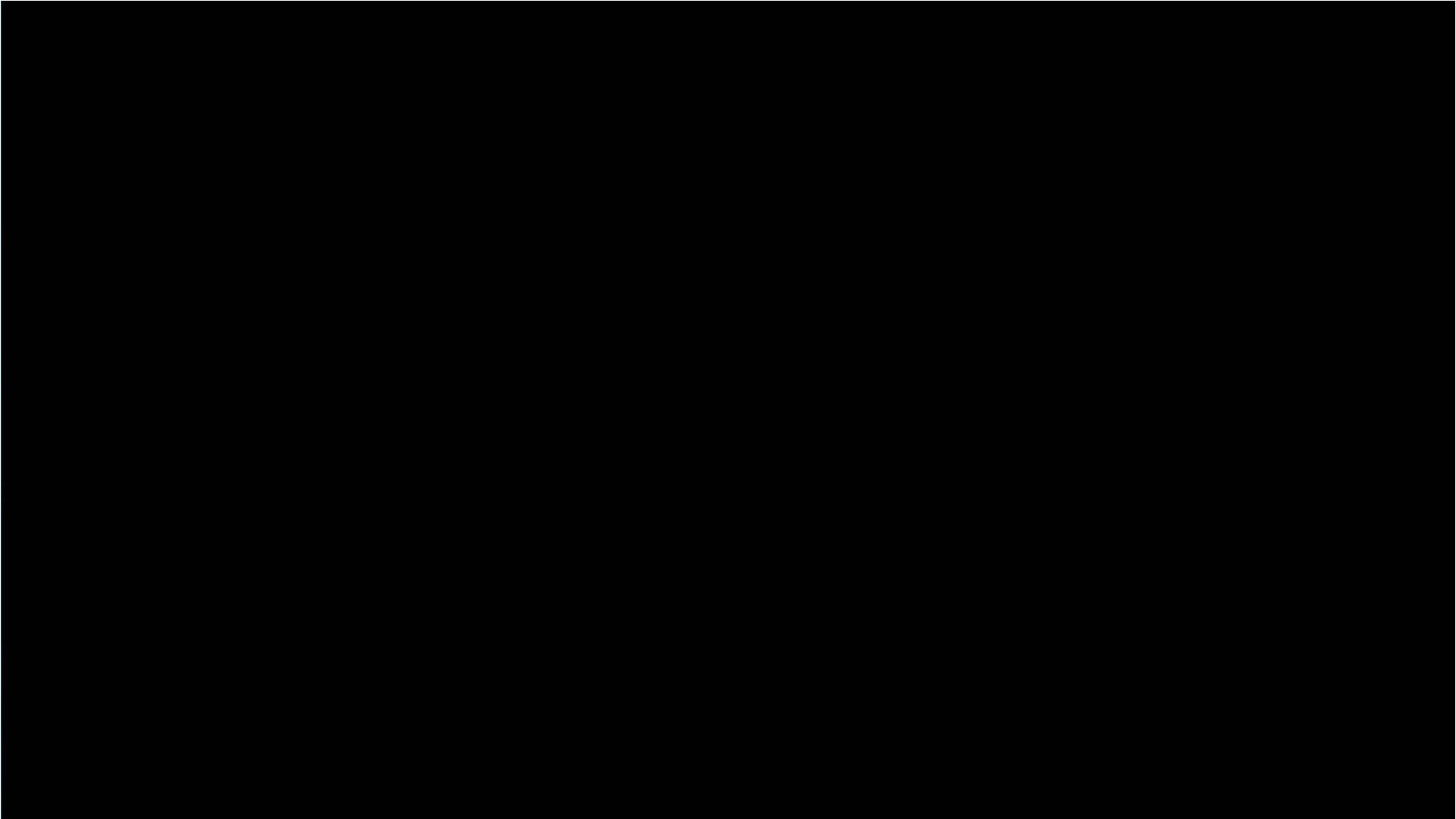
Q. And so the MARC record date for the National Geographic magazine would have been ten years past 20 -- excuse me, 2015 for that March 2025 volume for that library, right?

A. Correct.

New issues of a periodical are appended to the previously existing MARC record for the sake of expediency.

Ex. 1014, 24:21-25:22

Demonstrative Only - Not Evidence PO-57



Overview of the '518 Patent

(57)

ABSTRACT

A broadband local area data network uses coaxial cable wiring for interconnection of terminal devices. Orthogonal frequency division multiplexing (OFDM) with bit loading is used to overcome channel impairments and provide a path for terminal devices to transmit to and receive from other terminal devices. Probe messages are sent between devices to characterize the communication channel and determine optimum bit loading. The data network shares the cable spectrum with other services and uses frequency bands not used by other services. Adaptive power control can be used to maintain signal to noise ratio in a communication between terminal devices. Frequency coordination can be used to avoid interference between the LAN communications and other services transmitted on the cable.

Ex. 1001, Abstract; POR, 8

The present invention uses a form of multi-carrier modulation, orthogonal frequency division multiplex (OFDM), to transmit digital data signals through the coaxial cable wiring installed in homes. Communication is achieved through splitters and signal impairments caused by reflections and attenuation are overcome.

Ex. 1001, 4:36-42; POR, 11

Demonstrative Only - Not Evidence PO-59

Overview of Amit

(12) United States Patent Amit

(10) Patent No.: US 7,127,734 B1
(45) Date of Patent: Oct. 24, 2006

(54) SYSTEM AND METHODS FOR HOME NETWORK COMMUNICATIONS

(75) Inventor: **Mati Amit**, Zur-Yigal (IL)

(73) Assignee: **Texas Instruments Incorporated**,
Dallas, TX (US)

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

(21) Appl. No.: **09/548,048**

(22) Filed: **Apr. 12, 2000**

Related U.S. Application Data

(60) Provisional application No. 60/128,810, filed on Apr.
12, 1999.

(51) Int. Cl.
H04N 7/18 (2006.01)

(52) U.S. Cl. **725/80; 725/82**

(58) Field of Classification Search **725/74,**
725/78, 80, 81, 82, 85, 111, 110, 131, 133,
725/139, 141, 151, 153; H04N 7/18, 7/16
See application file for complete search history.

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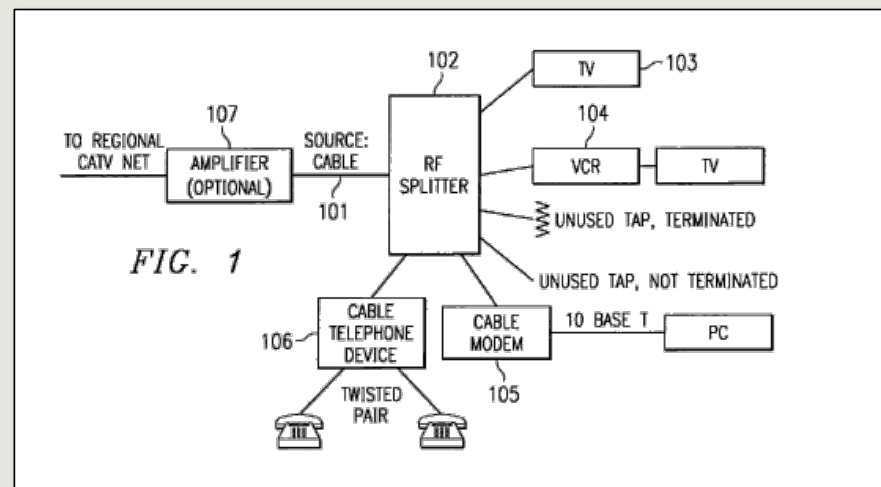
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Primary Examiner—Vivek Srivastava
(74) Attorney, Agent, or Firm—Abdul Zindani; W. James
Brady, III; Frederick J. Telecky, Jr.

(57) ABSTRACT

The present invention provides the ability to use existing
cable TV wires for home networking.

18 Claims, 8 Drawing Sheets



Ex. 1014, Fig. 1; POR, 26

Ex. 1014, Cover; POR, 26

Demonstrative Only - Not Evidence PO-60

Overview of Jacobsen

An Efficient Digital Modulation Scheme for Multimedia Transmission on the Cable Television Network

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Stanford University
Stanford, California 94305-4055

Abstract

We present a comparison between the performances of single-carrier modulation with equalization and multicarrier modulation on simulated cable television (CATV) channels. Simulations indicate that for a given data rate, the complexity of multicarrier is significantly lower than that of a single-carrier system. Furthermore, multicarrier is able to reduce the effects of various distortions on a CATV network, including microreflections and interference from external signals such as amateur radio, with a reasonable computational complexity while achieving information bit rates on the order of 80 Mbits/s.

Introduction

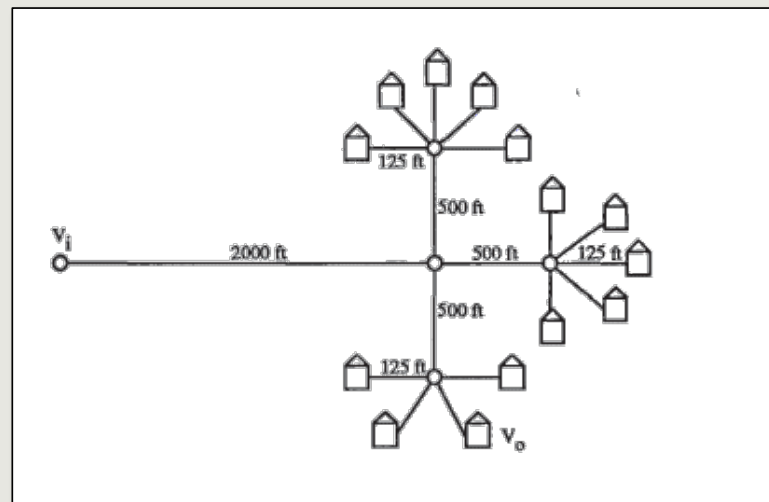
The feasibility of offering high-speed interactive data services to customers on CATV networks or similar broadband coaxial networks is currently being investigated by a number of service providers. With over 92% of the homes in the United States passed by cable, the CATV network is a potential supplier of these interactive data services. However, there are several electrical transmission problems that must be overcome before these services can be supplied reliably over CATV networks.

Presently, CATV networks are generally simplex broadcast tree- or star-structured networks. How-

*This work was supported by NSF contract number NCR-9203131, JSEP contract number NCR-9203131, NASA contract number NAG2-842, and an NSF Graduate Fellowship.

ever, these networks can be converted for duplex service, as some already have been, by replacing amplifier/repeater segments with so-called "diplex" filters and amplifiers that separate the downstream frequencies (50-550 MHz) from upstream frequencies (5-40 MHz) for interactive transmission. Some CATV networks can also have high-frequency attenuation reduced by the installation of equalizing diplex amplifiers that can boost the usable spectrum to 1 GHz. Even after such installation, however, the network operator finds that only some channels are available for new digital services. Consequently, the deployment of digital services is likely to be incremental and to demand high spectral efficiency in those channels allocated for the new services.

The transmission of digital signals over the CATV network is complicated by two general effects. First, the hardware in CATV networks is not ideal. Taps, amplifiers, and splitters can all cause signals to be reflected at their insertion points. In particular, splitters in subscriber homes are known to have poor isolation characteristics. The effect of reflected signals on the frequency transfer characteristic of a CATV channel is passband ripple, which is known to cause "ghosting" in received analog signals. The effects of rippling on digital signals, however, are more severe. Variations in a channel's frequency response cause successively transmitted symbols to interfere with one another, an effect known as intersymbol interference (ISI). Depending on the absolute deviations of the channel magnitude response (which are determined by the magnitudes of impedance mismatches on a CATV system) and the frequency with which those deviations occur in the frequency response (which depends on the length of coaxial cable between mismatches), a given symbol could interfere significantly with a large number of adjacent symbols. Without some scheme to combat ISI, a receiver would make detection errors. In turn, the detection errors could disable, for example, a digital video

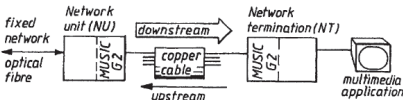


Ex. 1016, Fig. 2; POR, 44

Ex. 1016, 8; POR, 26

Demonstrative Only - Not Evidence PO-61

Overview of *Isaksson*

 PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION International Bureau	
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)	
(51) International Patent Classification ⁶ : H04L 5/06, 2/726	(11) International Publication Number: WO 98/10545 (43) International Publication Date: 12 March 1998 (12.03.98)
(21) International Application Number: PCT/SE97/01277 (22) International Filing Date: 15 July 1997 (15.07.97) (30) Priority Data: 9603187.7 2 September 1996 (02.09.96) SE	A1 (74) Inventor, and (75) Inventor/Applicants (for US only): KARLSSON, Mikael [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), JOHANSSON, Magnus [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), TONVALL, Harry [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), OLSSON, Lennart [SE/SE]; Tella Research AB, Rudsjösterrassen 2, S-977 75 Luleå (SE), STEFANSSON, Tomas [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), CHMAN, Hans [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), BAILENBERG, Gunnar [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), ISAKSSON, Anders [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), ÖKVIST, Göran [SE/SE]; Tella Research AB, Aurorum 6, S-977 75 Luleå (SE), LJUNGGREN, Lis-Marie [SE/SE]; Tella Research AB,
(71) Applicant (for all designated States except US): TELIA AB [SE/SE]; Märbackagatan 11, S-123 86 Farsta (SE).	(74) Agent: KARLSSON, Berne; Tella Research AB, Rudsjösterrassen 2, S-136 80 Haninge (SE). (83) Designated States: NO, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LI, MC, NL, PT, SE). Published With international search report.
(54) Title: IMPROVEMENTS IN, OR RELATING TO, MULTI-CARRIER TRANSMISSION SYSTEMS	
	
(57) Abstract In a multi-carrier system there is always a need to exchange control information between a transmitter and a receiver. This information is generated in the receiver and terminated in the transmitter. This information contains data on the instantaneous characteristics of the channel and information about system change decisions needed to handle the changes in channel characteristics. In systems that use bit-loading techniques the number of transmitted bits per symbol is adapted, or regulated, to the signal-to-noise ratio (SNR) of the current carrier wave. This regulation dynamically effects, in time, the total bandwidth of the system. This variation in bandwidth leads to an absolute system requirement for synchronous configuration of the transmitter and the receiver, in terms of the number of coded/decoded bits per symbol and carrier wave. If this requirement is not met the system will be unable to maintain a connection.	

Improvements in, or Relating to,
Multi-carrier Transmission Systems

The present invention relates to multi-carrier transmission systems, particularly to multi-carrier transmission systems having the facility to dynamically change carrier bit-loading and a method of synchronising the updating of parameters relating to bit-loading.

Ex. 1013, 1:3-7; POR, 12

Ex. 1013, Cover; POR, 12

Demonstrative Only - Not Evidence PO-62

Overview of Kliger

(19) **United States**

(12) **Patent Application Publication**
Kliger et al.

(10) Pub. No.: US 2002/0069417 A1
(43) Pub. Date: Jun. 6, 2002

(54) **HOME NETWORK SYSTEM AND METHOD**

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(21) Appl. No.: 09/943,424

(22) Filed: Aug. 30, 2001

Related U.S. Application Data

(63) Non-provisional of provisional application No. 60/229,263, filed on Aug. 30, 2000. Non-provisional of provisional application No. 60/230,110, filed on

Sep. 5, 2000. Non-provisional of provisional application No. 60/275,060, filed on Mar. 12, 2001. Non-provisional of provisional application No. 60/291,130, filed on May 15, 2001. Non-provisional of provisional application No. 60/297,304, filed on Jun. 11, 2001.

Publication Classification

(51) Int. Cl.⁷ H04N 7/18

(52) U.S. Cl. 725/78; 725/74

ABSTRACT

A home network, in one embodiment including a home wiring system; a demarcation point unit in electrical communication with the home wiring system; and a home network module in electrical communication with the home wiring system. The home network module is adapted for connection to a home electronic device. The demarcation point unit passes data to and receives data from the home electronic device through the home network module.

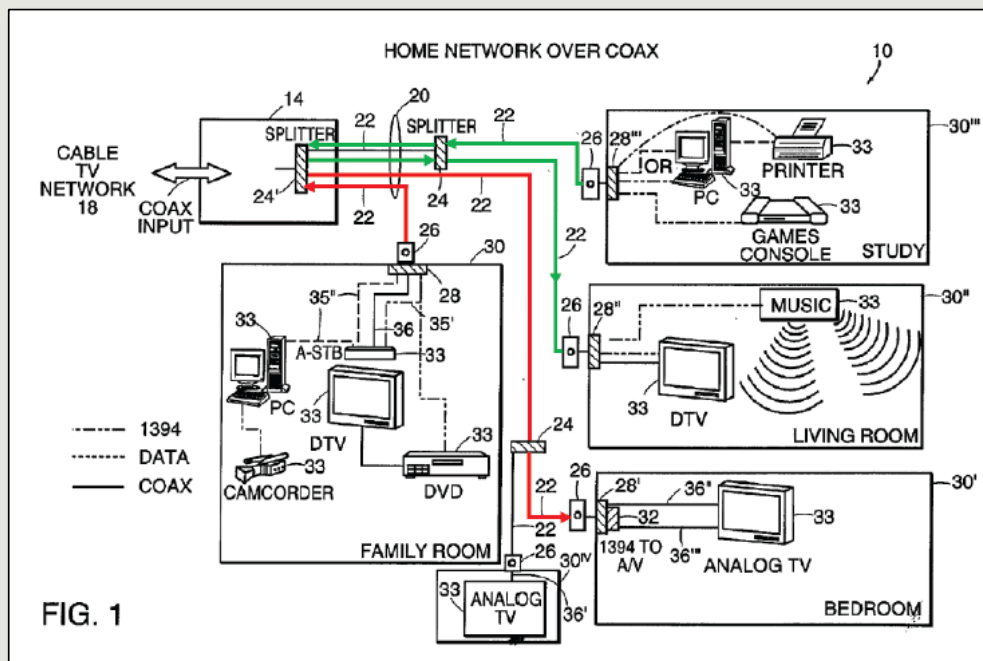


FIG. 1

Ex. 1007, Cover; POR, 49

Ex. 1007, Fig. 1 (annotated in Ex. 2002, 155); POR, 62

Demonstrative Only - Not Evidence PO-63