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**UTILITY
PATENT APPLICATION
TRANSMITTAL**

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. **AGLE0001**First Inventor or Application Identifier **Calderone et al.**Title **System and Method of Voice Recognition Near a Wireline...**Express Mail Label No. **EL540887154US****APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ * Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages **134**]
(preferred arrangement set forth below)
- Descriptive title of the invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets **35**]
4. Oath or Declaration [Total Pages **3**]
- a. ☒ Newly executed (original or copy)
 - b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
 - i. ☐ **DELETION OF INVENTOR(S)**
Signed statement attached deleting
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see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY
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Washington, DC 20231

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6. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
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 - c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☒ Assignment Papers (cover sheet & document(s))
8. ☒ 37 C.F.R. § 3.73(b) Statement ☒ Power of
(when there is an assignee) Attorney
9. ☐ English Translation Document (if applicable)
10. ☒ Information Disclosure ☒ Copies of IDS
Statement (IDS)/PTO-1449 Citations
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. ☒ * Small Entity ☐ Statement filed in prior application,
Statement(s) Status still proper and desired
(PTO/SB/09-12)
14. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
15. ☐ Other: _____

16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____

Prior application information: Examiner _____ Group / Art Unit: _____

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17. CORRESPONDENCE ADDRESS☒ Customer Number or Bar Code Label**22862**or ☐ Correspondence address below

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Name (Print/Type)

Michael A. Glenn

Registration No. (Attorney/Agent)

30,176

Signature

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TOTAL AMOUNT OF PAYMENT (\$) 849.00

Complete if Known

Application Number	Unassigned
Filing Date	Herewith
First Named Inventor	Calderone et al.
Examiner Name	Unassigned
Group / Art Unit	Unassigned
Attorney Docket No.	AGLE0001

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to

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Deposit Account Name Michael A. Glenn

- ☒ Charge Any Additional Fee Required Under 37 CFR §§ 1.16 and 1.17

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 760	201 380	Utility filing fee	355.00
106 310	206 155	Design filing fee	
107 480	207 240	Plant filing fee	
108 760	208 380	Reissue filing fee	
114 150	214 75	Provisional filing fee	

SUBTOTAL (1) (\$) 355.00

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
66	-20** = 46	9	414.00
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Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
103 18	203 9	Claims in excess of 20	
102 78	202 39	Independent claims in excess of 3	
104 260	204 130	Multiple dependent claim, if not paid	
109 78	209 39	** Reissue independent claims over original patent	
110 18	210 9	** Reissue claims in excess of 20 and over original patent	

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FEE CALCULATION (continued)

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127 50	227 25	Surcharge - late provisional filing fee or cover sheet	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
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115 110	215 55	Extension for reply within first month	
116 380	216 190	Extension for reply within second month	
117 870	217 435	Extension for reply within third month	
118 1,360	218 680	Extension for reply within fourth month	
128 1,850	228 925	Extension for reply within fifth month	
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SUBMITTED BY

Name (Print/Type) Michael A. Glenn

Registration No. (Attorney/Agent) 30,176

Complete (if applicable)

Telephone 650-474-8400

Signature

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**SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A
WIRELINE NODE OF A NETWORK SUPPORTING CABLE
TELEVISION AND/OR VIDEO DELIVERY**

This application claims priority from Provisional Patent Application no.
5 60/210,440, entitled Method and Apparatus for Centralized Voice-Driven
Natural Language Processing, docket number AGLE0001PR, filed 8 June,
2000.

This application is a continuation in part from Application no. 09/679,115,
entitled System and Method of a Multi-dimensional Plex Communication
10 Network, docket number AGLE0003, filed 14 October, 2000;

Application no. 09/664,874, entitled Increased Bandwidth In Aloha-Based
Frequency-Hopping Transmission Systems, docket number AGLE0005, filed
19 September, 2000;

Application no. 09/661,486, entitled N-way Demultiplexor, docket number
15 AGLE0008, filed 14 September, 2000; and

Application no. 09/708,315, entitled Common Carrier, Multiple Output RF
Upconverter docket number AGLE0015, filed 7 November, 2000.

Background of the Invention

Technical field

20 This invention relates to voice recognition performed near a wireline node of a
network supporting cable television and/or video delivery.

Background Art

Currently, voice operated functions using the latest voice recognition technologies are limited to a handful of applications, such as toys, appliances, some computers, voice dictation, cellular phones, and voice control of one's home. Most of these applications use voice recognition technology running on a computer or voice recognition chip technology. These voice recognition systems typically offer only a limited number of commands and the recognition efficiency is only fair and often require voice training.

There have been numerous patents issued regarding voice recognition. Many apply in a telephone context or other dial-up context such as an Automated Teller machine (ATM), including the following: Rabin, *Voice command control and verification system*, U.S. Patent No. 6,081,782, issued June 27, 2000, Basore, et al, *Voice activated device and method for providing access to remotely retrieved data*, U.S. Patent 5,752,232, issued May 12, 1998, and Kowalkowski, et al, *Voice-control integrated field support data communications system for maintenance, repair and emergency services*, U.S. Patent No. 5,924,069, issued July 13, 1999.

There is, however, another class of voice recognition technology referred to as natural language, which requires state of the art processing software and hundreds of megabytes of RAM to support. Natural language voice recognition is currently being used in high end systems, such as billing applications for utility companies and the New York Stock Exchange, because of its ability to recognize spoken words from any voice. Some natural language systems claim to be totally user independent and are also capable of recognizing speech in several different languages.

However, the problems of voice recognition at a centralized wireline node in a network supporting video delivery or cable television delivery have not been addressed by such prior art. For the purposes of the discussion herein, a centralized wireline node refers to a network node providing video or cable television delivery to multiple users using a wireline physical transport between those users at the node.

Figure 1 depicts a typical network as found in a cable television and/or video delivery network employing a Hybrid Fiber-Coaxial (HFC) wiring scheme as disclosed in the prior art.

Each user site contains a Set Top Box, such as STB **180**, coupling to the network through a coaxial cable **172**, which interfaces **170** to a collective coaxial cable **160** which couples to a Node **126**. The interface **170** may include bi-directional signal amplification and possibly further include the filtering and/or frequency shifting of these signals.

The Node **126** is hierarchically coupled **128** to a Headend **104**, which in most cable television networks serves as the source of television programming and other signaling. The signals are sent through the Node **126** and couplings **160-170-172** to provide the STB **180** and others, with the television signaling. In certain large towns and cities, there may be a further hierarchical layer including a Metropolitan Headend **10** coupled **106** to Headend **104**. These higher layers of the network use fiber optics for the physical transport of couplings **102**, **106** and **108**, as well as for **122**, **126** and **128**.

The couplings between STB **180** and Node **126** support bi-directional communication. The couplings between STB **180**, Node **126** and Headend

104 may also support bi-directional communication. Such bi-directional communication allows the STB 180 to receive multiple television channels. This bi-directional communication allows STB 180 to signal at least limited information to the Node 126 and/or the Headend 104. Such information in
5 either case may support management of Pay-per-View and other services.

User site accounting information usually resides at the highest level of the network, which tends to be either the Headend 104 or Metropolitan Headend 10.

In cable systems, several downstream data channels that send channel and
10 synchronization information are often transmitted in a previously reserved band of frequencies. They are typically assigned for re-broadcasting FM channels over cable in the United States. Currently, most cable systems reserve some of the 88 to 108 MHz FM spectrum for set-top data transmission. The unused portion of that spectrum are left for barker channels
15 or for additional video channels. The Open Cable Standard requires that the 70 to 130 MHz band be available for what's called Out-of-Band or (OOB) or Downstream transmission.

Most current cable systems use the popular HFC architecture so that the downstream video signals, digital or analog, are sent from the Headend to
20 hubs or nodes via fiberoptic cable. At the receiving side of the node, the optical signal from the fiber gets converted to an electrical signal containing all of the analog, digital video RF carriers and program/service information. This signal, in turn, is amplified and distributed via coaxial cable to the appropriate subscribers connected to the node.

1 A major design objective for existing cable television set-top boxes was
efficient downstream information delivery, *i.e.* from cable plant to subscriber.
Provision for upstream data transmission, *i.e.* from subscriber to cable plant,
is much more restrictive, supporting only limited bandwidth. As new classes of
5 interactive services become available, efficient use of upstream transmission
bandwidth grows in importance. For example, if it is necessary to pass voice
information from the subscriber to the cable headend (also known as the
headend), sufficient upstream bandwidth must be made available.

One of the most popular digital set-top boxes, the General Instruments (now
10 Motorola) DCT-2000, is a useful example. When this box was first deployed,
upstream transmissions were restricted to user pay-per-view requests, and
other simple, infrequent transmissions. As a consequence, the transmission
format used for upstream transmissions was not required to be very efficient,
and in fact, is not.

15 In this set-top box, the transmission hardware is capable of selecting twenty
different 256K bps channels, each of which uses QPSK transmission coding.
While the hardware is capable of frequency-hopping to avoid channels which
are subject to interference, the scheme used is fairly static, with typical
deployments only using two active upstream communications channels. This
20 leads to an aggregate bandwidth of only 512K bps per cluster of set-top boxes
converging in the network to a node, in cable television terms. The cable node
typically supports between 500 and 2000 subscribers.

Upstream signals in the 5 to 40 MHz band from each subscriber connected to
the node are collected, combined, and then sent to the Headend via either the
25 same fiber used for the downstream video carriers, or a separate fiber.

Furthermore, the transmission control protocol used, referred to as Aloha, is one where an individual set-top box immediately transmits any pending request to the headend, without regard to whether or not the transmission channel is already in use. This transmission is repeated at regular intervals
5 until the box receives an acknowledgement command from the headend, indicating successful receipt of the transmission.

This transmission control protocol is quite inefficient due to the number of collisions which ensue, *e.g.* simultaneous transmissions from different set-top boxes which interfere with one another, forcing all of the transmitters to repeat
10 their transmissions again. This leads to typical channel utilization on the order of just 30%. As a consequence, the total bandwidth available for upstream transmission per node is only about 30% of 512K bps = ~137K bps, on average.

Downstream control data transmission typically occurs in a separate
15 frequency band from the upstream channels.

Typically, HFC networks employ an optical fiber from a central office, or Headend, to a neighborhood node. The fiber has forward and reverse transmission capability, which can alternatively be accommodated on separate fibers. Wavelength Division Multiplexing (WDM) can be used to
20 implement both on a single fiber. At the node, coaxial cable connects the users through a shared frequency division multiplexing (FDM) scheme with contention resolution protocols used to manage upstream data flows.

Such communication schemes having both forward and backward paths, and which may or may not involve a user, are referred to as loops herein. An

example of a loop is the communication between Headend **104** and Node **126**. Communication schemes having both forward and backward paths to multiple users are referred to as local loops. An example of a local loop is the communication between Node **126** and user site STBs **180**, **182** and **184**.

5 Note that a loop may be constituted out of optical fiber or out of coaxial cable.

Hybrid-Fiber-Copper (HFCop) networks work in much the same manner, but substitute copper wire(s), often in twisted pairs, for coaxial cable. In such networks a local loop may further be constituted out of optical fiber, coaxial cable or twisted pairs.

10 Another alternative local loop configuration is commonly known as Switched Digital Video. It is a form of HFC coupling the fiber through a node to each user site with a distinct point-to-point coaxial cable. The node interfaces the user site coaxial cables with the optical fiber through a switch. The switch typically contains a network management unit which manages the switch,
15 connecting the bandwidth service provider with multiple homes, today often in the range of five to 40 homes per switch.

The Synchronous Optical NETwork (SONET) scheme is also applied in the creation of high-speed networks for homes and businesses. This and similar communication schemes may be employed to deliver video streams to user
20 sites.

Figure **2** depicts a typical residential broadband network using local loop wiring of the network, as disclosed in the prior art.

As in Figure **1**, each user site contains a Set Top Box, such as STB **180**, coupled to the network through a coaxial cable **172** which interfaces **170** to a

collective coaxial cable **160** which is coupled to Node **126**. Interface **170** may include bi-directional signal amplification, and possibly further include the filtering and/or frequency shifting of these signals.

As in Figure **1**, the couplings between STB **180** and Node **126** support bi-directional communication allowing the STB **180** to receive multiple television channels and allowing STB **180** to signal at least limited information to the Node **126**, which may well include management of Pay-per-View and other services. The couplings between STB **180**, Node **126** and Headend **104** may also support bi-directional communication allowing the STB **180** to receive multiple television channels and allowing STB **180** to signal at least limited information to the Headend **104**, which may well include management of Pay-per-View and other services.

Figure **2** shows a loop coupling Headend **104** through coupling **130** to Node **120** through coupling **132** to Node **124** through coupling **134** to Node **126** which in turn couples **136** to Headend **104** forming the loop.

The hierarchical coupling of Node **126** with Headend **104** is carried out along distinct paths through this loop. Communication from Headend **104** to Node **126** follows a path **130-132-134**. Communication from Node **126** to Headend **104** follows the path **136**. The specific wiring schemes are dominated by the choice of physical transport, communication protocols and network level management. The description just given for Figure **2** is provided as a simplified discussion of the basics of how high speed residential broadband networks incorporate loops and local loops supporting network level hierarchies.

There has been extensive research into the mechanics of speech recognition. The progress has been sufficient to allow voice trading by stock brokers using their desk top computers.

While these innovations have been substantial, they do not resolve several central questions of great importance to cable television, video delivery systems, and commerce. There is no present system providing voice recognition to a collection of users over a cable television network. There is no present system providing user identification based upon that voice recognition over a network that supports cable television and/or video delivery. There is no present system sufficient for real-time auctions and contracting to be conducted over a cable television and/or video delivery network, based on user identification through voice recognition.

Summary of the invention

An embodiment of the invention provides speech recognition services to a collection of users over a network that supports cable television and/or video delivery. User identification based upon speech recognition is provided over a cable television and/or video delivery network. User identified speech contracting is provided over a cable television and/or video delivery network having sufficient bandwidth for real-time auctions and contracting.

The invention comprises a multi-user control system for audio visual devices that incorporates a speech recognition system that is centrally located in or near a wireline node, and which may include a Cable Television (CATV) Headend. The speech recognition system may also be centrally located in or near a server farm a web-site hosting facility, or a network gateway.

In these embodiments of the invention, spoken commands from a cable subscriber are recognized and then acted upon to control the delivery of entertainment and information services, such as Video On Demand, Pay Per View, Channel control, on-line shopping, and the Internet. This system is unique in that the speech command which originates at the user site, often the home of the subscriber, is sent upstream via the return path (often five to 40 MHz) in the cable system to a central speech recognition and identification engine. The speech recognition and identification engine described herein is capable of processing thousands of speech commands simultaneously and offering a low latency entertainment, information, and shopping experience to the user or subscriber.

The system is capable of overlaying text on the subscriber's TV screen immediately after a word is recognized by the system as a verification of correct or incorrect recognition, thereby providing instant visual feedback and opportunity for acceptance or correction of speech messages.

The system can recognize and process speech so that the key words of spoken commands are recognized and displayed. This may be applied in navigation mode, in search context, or in other contexts and modes.

The system responds to a command with a visual indication of the spoken request. This visual feedback indicates recognition of key words may and be in the form of written text or icons.

The system may mask delays in upstream transmission or speech recognition. Upon depressing an optional talk button on the remote, a digital address may be appended to the beginning of the digital speech packets to

be processed. The address tells the system not only the user site, but it also provides a mechanism for the system to begin generating masking screens or icons. Data are sent to the central location when the button on the microphone is depressed, alerting the system as to the user site and a potential input. This function allows the system to generate an icon or overlay to respond to the subscriber quickly. This function also supports site specific dictionaries, as well as voice data references to be loaded for speech recognition or user recognition.

At least two operations are performed at a server-center located at a central location: upstream recognition of speech commands and performing speech command protocol(s).

Low latency visual prompts are provided to support fast and accurate speech navigation. Thus, when a command is spoken and recognized the system returns the key word and optionally generates a list of visual prompts that guides the subscriber through the next navigation step. By using prompts, the system incorporates optimum recognition of the prompt words thus increasing the recognition accuracy and, at the same time, increasing satisfaction for user participation.

In this context of the invention, adaptive speech recognition is based on optimized word recognition by creating a subset of probable matches based on knowing what is in an entertainment database or the words on a Web page. This supports learning the user's habitual speech patterns.

Secure speech transactions provide a method of speech based contracting across a multimedia distribution system. Speech based contracting as used

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The control processors of the AgileTV™ engines may be treated differently by the message routing algorithms: No messages may be routed through the control processors, CPU 8.0 and 8.4, headed for a different destination. The CPU 8.0 and 8.4 IO lines may support internal management functions within the node of the cable network, specifically management and billing. This is advantageous for security, making it harder for hacker attacks to penetrate to the management and billing communications, since such attacks will not be able to directly communicate with CPU 8.0 and 8.4 or their IO lines.

Alternatively, special classes of communications may route through the control processor with defined protocols. Other types of communications may transit the node to which the control processor belongs, but may not terminate at the control processor. While it is common for large-scale networks to be partitioned, this partitioning approach is novel, providing very well characterized data paths for both management and billing communications.

It is advantageous that the control processor owns the disk resources, so that sensitive information such as credit card information does not go through less secure components of the plex network. Sensitive information goes directly from the disk resource through the control processor to the billing application.

Security may be heightened by use of at least one encryption standard including the AES algorithm recently proposed by the US government.

Input processors (8.1 and 8.5) perform the following: receiving incoming voice packets; buffering the received voice packets; detecting last packet of the received packet sequence to create a complete packet-sequence; and

terms and/or optional terms which may be exercised after the contract has been accepted.

Speech based contracting may also include an identified user exercising one or more optional terms of a pre-existing contract. The exercise of the optional terms may further specify one or more amounts, delivery times, ranges of time and/or place during/over which a service may be performed or commodity delivered in accordance with the optional terms of the pre-existing contract.

The offer may originate at the offeror-user site, possibly involving speech, when it is sent to the central location and recognized at the central location, recorded, distributed, and presented to potential offeree user sites. The offer may be sent to the central location to be recorded and distributed to potential offeree user sites. The offeree may signal acceptance of the offer verbally at the offeree user site where the offeree is recognized. The system transmits the verbal acceptance to the central location, where it is recognized, recorded and then transmitted to the offeror.

Using the user site address accelerates speaker identification, increases reliability, enhances security and reduces latency in identifying a speaker. Using the user site address and user specific voice data references further accelerates speaker identification, increases reliability, enhances security, and reduces latency in identifying a speaker.

The invention supports automatic generation of serial-multiplexed video output streams, without additional video boards or multiplexers. The centrally located speech recognition system employs extremely fast, efficient arrays of microprocessors, many of which may possess a frame buffer in locally

accessible memory. Each microprocessor translates the frame buffer into an MPEG stream. Several MPEG streams are merged within a single microprocessor to form a multi-media stream for distribution to subscribers.

Brief Description of the Drawings

- 5 Figure 1 depicts a typical network hierarchy as found in a cable television or video delivery network employing a Hybrid Fiber-Coaxial (HFC) wiring scheme as disclosed in the prior art;

Figure 2 depicts a typical residential broadband network using local loop wiring of the network as disclosed in the prior art;

- 10 Figure 3 depicts a remote control unit **1000** coupled **1002** to set-top apparatus **1100**, communicating via a two-stage wireline communications system containing a wireline physical transport **1200** through a distributor node **1300**, and through a high speed physical transport **1400**, possessing various delivery points **1510** and entry points **1512-1518** to a tightly coupled server farm **3000**, with one or more gateways **3100**, and one or more tightly coupled server arrays **3200**, in accordance the invention;
- 15

Figure 4 depicts a coupled server array **3200** of Figure 3;

Figure 5 depicts a gateway **3100** of Figure 3;

- Figure 6 depicts the tightly coupled server farm **3000** of Figure 3 implemented in a two-dimensional plex communication network with N=4 plex nodes in each of two orthogonal directions of the node array;
- 20

Figure 7 depicts a gateway **3100** of Figure 3 implemented in a two-dimensional plex communication network with $N=4$ plex nodes in each of two orthogonal directions of the node array;

Figure 8 depicts a coupled server array **3200** of Figure 3 implemented in a two-dimensional plex communication network with $N=4$ plex nodes in each of two orthogonal directions of the node array;

Figure 9 depicts a simplified block diagram using an array of processors as shown as **3200** in Figure 3;

Figure 10 depicts a flowchart of a method using a back channel from a multiplicity of user sites containing a multiplicity of identified speech channels presented to a speech processing system at a wireline node in a network supporting cable television delivery in accordance with the invention;

Figure 11A depicts a detail flowchart of operation **2012** of Figure 10 further partitioning of the received back channel;

Figure 11B depicts a detail flowchart of operation **2022** of Figure 10 further processing the multiplicity of the received identified speech channels;

Figure 11C depicts a detail flowchart of operation **2032** of Figure 10 further responding to the identified speech content;

Figure 12 depicts a detail flowchart of operation **2000** of Figure 10 further performing the method using the back channel from multiple user sites;

Figure 13A depicts a detail flowchart of operation **2112** of Figure 11C further responding to the identified speech content;

Figure **13B** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the speech content;

Figure **14** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

5 Figure **15A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

Figure **15B** depicts a detail flowchart of operation **2252** of Figure **15A** identifying the user;

10 Figure **16** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

Figure **17A** depicts the speech content response **2350** including current response menu **2352** and cumulative user site response **2354** in accordance with the invention;

15 Figure **17B** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

Figure **18A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

Figure **18B** depicts a detail flowchart of operation **2092** of Figure **11B** further processing the multiplicity of the received speech channels;

20 Figure **19A** depicts a simplified block diagram of a hand held remote **1000**, containing microphone **1060** and keypad **1020** supporting user input which is organized and processed by embedded controller **1050** for communication by

wireless interface **1040** coupled **1002** to set-top apparatus **1100**, as shown in Figure 3;

Figure **19B** depicts a simplified block diagram of set-top apparatus **1100** as shown in Figure 3 showing coupling **1002** and first wireline physical transport **1200** further comprised of downlink coupling **1202** and uplink coupling **1204**;

Figure **19C** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000** and coupled **1112** with set-top box **1110** possessing downlink coupling **1202** and uplink coupling **1204**;

Figure **19D** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000** and possessing downlink coupling **1202** and uplink coupling **1204** as well as providing processed downlink coupling **1114** to set-top box **1110** and receiving initial uplink coupling **1112** from set-top box **1110**;

Figure **20A** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19C** supporting coupling **1002** with hand held remote **1000** and coupling **1112** with set-top box **1110**;

Figure **20B** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19D** supporting coupling **1002** with hand held remote **1000** and couplings **1112** and **1114** with set-top box **1110**;

Figure **20C** depicts a block diagram further depicting accessibly coupled **1162** memory **1160** as shown in Figures **20A** and **20B**;

Figure **21** depicts a remote control unit **1000-180** coupled **1002-180** to set-top apparatus **1100-180**, communicating via a two-stage wireline communications system containing a wireline physical transport **1200** through an augmented distributor node **1310** interfacing to a wireline communications loop including an augmented Headend **1410** further supporting a communications loop including augmented metropolitan Headend **1410**, in accordance with the invention;

Figure **22** depicts a remote control unit **1000-180** coupled **1002-180** to set-top apparatus **1100-180**, communicating via a two-stage wireline communications system containing a wireline physical transport **1200** through a distributor node **126** interfacing to a wireline communications loop including an augmented Headend **1414** further supporting a communications loop including augmented metropolitan Headend **1410**, in accordance with the invention;

Figure **23** depicts a detail block diagram of an augmented distributor node **1310**, coupled to wireline physical transport **1200** and coupled to the wireline communications loop of Figure **21**;

Figure **24** depicts an alternative detail block diagram of an augmented distributor node **1310**, coupled to wireline physical transport **1200** and coupled to the wireline communications loop of Figure **21**;

Figure **25** depicts a generic block diagram of a prior art Headend **104** as shown in Figure **3**;

Figure 26 depicts an augmented Headend 1410 of Figure 21 or an augmented Headend 1414 of Figure 22 or an augmented metropolitan Headend 1410 of Figures 21 or 22, in accordance with the invention;

Figure 27 depicts an alternative augmented Headend 1410 of Figure 21 or an
5 alternative augmented Headend 1414 of Figure 22 or an alternative augmented metropolitan Headend 1410 of Figures 21 or 22, in accordance with the invention;

Figure 28A depicts a block diagram of a speech engine 1330 as shown in Figure 23;

10 Figure 28B depicts a block diagram of a speech engine 1330 as shown in Figure 24;

Figure 29 depicts a more detailed block diagram of a speech engine 1330 as shown in Figure 28A;

Figure 30 depicts an alternative detailed block diagram of a speech engine
15 1330 as shown in Figure 28A;

Figure 31 depicts a second alternative detailed block diagram of a speech engine 1330 as shown in Figure 28A;

Figure 32A depicts a block diagram of modulator engine 1350 of Figures 23 and 24, and modulator engine 1450 of Figures 26 and 27;

20 Figure 32B depicts a block diagram of a local oscillator as is known in the art for use as a local oscillator depicted in Figures 33 and 34 as LO1 1760, LO1 1860, LO2 1770 or LO2 1870;

Figure 33 depicts a detail block diagram of frequency conversion circuitry 1710 of Figure 32A;

Figure 34 depicts an alternative detail block diagram of frequency conversion circuitry 1710 of Figure 32A; and

- 5 Figure 35 depicts a detailed diagram of speech engine 1330 as shown in Figure 23 or speech engine 1430 as shown in Figure 27 containing two plex communications grids with dual, redundant gateways.

Detailed Description of the Invention

10 Figure 3 depicts a remote control unit 1000 coupled 1002 to set-top apparatus 1100. Set-top apparatus 1100 communicates via a two-stage wireline communications system containing a wireline physical transport 1200 to a distributor node 1300. Set-top apparatus 1100 communicates through distributor node 1300 across a high-speed physical transport 1400 to a tightly coupled server farm 3000, possessing various delivery points 1510 and entry
15 points 1512-1518. Tightly coupled server farm 3000 contains one or more gateways 3100, and one or more tightly coupled server arrays 3200.

As used herein, a server farm refers to a collection of at least two server components communicatively coupled to one another. The server components may or may not all be directly communicatively coupled to each
20 other. A server component refers to at least a gateway, server array, server computer, database engine, or disk farm.

As used herein, gateway refers to at least one of the following: A gateway may perform protocol conversion between different types of networks or

applications; gateways may support complete conversion of one protocol to another, or support one protocol from within another protocol; a gateway may perform conversion between two messaging or mail protocols; a gateway may act as a go-between for two networks with similar protocols, providing an entry/exit point for one network in the other network. Such gateways include proxy servers; a gateway may switch speech and data between a terrestrial network and an orbiting satellite communications system; and a gateway may perform network layer switching tasks between at least two networks, coordinating the delivery of information, usually in the form of messages, packets or data streams to various destinations in the networks.

As used herein, a server array refers to a multi-dimensional lattice or array of server computers, each with an associated multi-dimensional array address, and a communication grid supporting communication between server computers based upon the multi-dimensional array addresses of the source and destination server computers. A tightly coupled server array is a server array possessing a very low latency communication grid.

The invention may include a remote control unit **1000** fitted with a microphone. Remote control unit **1000** may be fitted with such features as a special noise canceling microphone and/or a push-to-talk button.

The microphone in the remote relays the subscriber's speech commands to the central speech recognition engine. The push-to-talk button may begin the process of speech recognition by informing the system that the subscriber is about to speak and also to provide immediate address information. Address information identifies the user site at which the speaking occurs.

The invention may also include an array of microphones that are operated in conjunction with a remote control **1000** that is coupled to the set top box **1100**. The microphone array may further provide an echo-canceling capability in receiving voice signals within the area of usage.

5 Note that there may be more than one remote control unit **1000** with one or more microphones, each remote control unit under the control of a distinct, identified user. Such situations are particularly useful in game playing settings, where different users may wish to make commands to the game simulation like "arm the photon torpedoes", etc.

10 A given residence may include more than one set-top box **1100**, each of which has a distinct address in the network delivering video content and/or cable television. Each constitutes a distinct user site and may be parameterized differently. By way of example, a first set-top box in a recreation area for children may allow identified users, who are children, to
15 select programming on only certain channels. Whereas a second set-top box in a private area of adults, such as a parental bedroom, may be parameterized so that child identifier users have no privileges.

Speech commands from the subscriber may be preprocessed. The analog signals picked up from the microphone are converted to digital signals where
20 they undergo additional processing before being transmitted to the speech recognition and identification engine located in the cable Headend or other centralized location. Such speech preprocessing may include encryption, compression, or conversion to an alternative form of speech representation.

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The preprocessing function may also take place in the remote control **1000** itself before being transmitted to the set-top box **1100**, or set-top appliance **1100**. Coupling **1002** may use a wireline or wireless physical transport. Coupling **1002** may use a wireless transport, including, but not limited to, at least one of the infra-red, microwave, or radio frequency spectrum, as well as ultrasonic signaling. Coupling **1002** may support bi-directional communication between remote control **1000** and set-top box or appliance **1100**. The communication may be predominantly or strictly from remote control **1000** to set-top box or appliance **1100**.

The speech signal from the remote **1000** may be a digitally modulated RF signal whose properties may comply with Part 15 of the FCC rules. Alternatively, the set-top box **1100**, or set-top appliance **1100**, receives the speech signal from the remote **1000** and performs the preprocessing function mentioned above.

The set-top box **1100**, or set-top appliance **1100** may also be used to transmit speech and subscriber address data to the centralized location or Headend for speech recognition and identification. The Radio Frequency (RF) signal from the remote **1000** is received by the set-top appliance **1100** and then re-modulated for upstream transmission **1200** on the 5 to 40 MHz cable return path. If a commercial set-top box **1100** is used to transmit the upstream speech data, then the upstream channel allocation and transmission protocol are controlled by the bi-directional communication system which is resident in the set-top box.

In certain embodiments, a commercial set-top box **1100** may not be used to transmit the digitized speech data upstream. The set-top appliance **1100** is

then responsible for receiving the upstream channel allocation and synchronization information. The data receiver in the set-top appliance **1100** can be tuned to any one of several downstream data channels to receive channel and synchronization information.

5 The set-top appliance **1100** is also capable of receiving and decoding data in the downstream path. This function is required to organize and synchronize the transmission of upstream data which may include user feedback. Downstream data can contain upstream channel allocation information and speech verification overlay information coded as text.

10 The set-top box **1100** may be used for both upstream and downstream communication for the described speech command function. The function of the set-top appliance **1100** may be to receive the RF signal from the remote control and then digitize and compress the speech signal and prepare it for upstream transmission.

15 New RF protocol standards, such as Blue Tooth, allow the remote control's RF signal to transmit the speech signal directly to the set-top box where again, the preprocessing can either be done in the remote control **1000** or executed from firmware within the set-top box **1100**. Note that infra-red signaling may be employed to transmit the speech signal to the set-top box.

20 Set-top boxes **1100** that employ the DOCSIS type cable modems such as Open Cable set-top boxes or the so called Heavy Set-top boxes from such companies as Scientific Atlanta and General Instruments are capable of sending and receiving speech data using efficient data transmission protocols. The DOCSIS protocol also incorporates error detection and correction

capabilities as well as other transmission enhancements such as pre-equalization for more efficient and error free transmission.

Figure 4 depicts a coupled server array **3200** of Figure 3.

Figure 5 depicts a gateway **3100** of Figure 3.

5 The system uses the subscriber's address information as a mechanism by which the centrally located AgileTV™ Speech Processor can fetch a particular subscriber's parameter file. The parameter file contains speech training parameter data, speech identification parameters and user profiles for each user at that address. This file can also contain parental control information in
10 a residential setting and other specifics for that particular address, such as language preferences or movie preferences or even internet preferences.

The Addressed Subscriber Parameter File (ASPF) gives the system an extremely high probability of speech recognition and user identification. Such addressing supports secure transactions such as banking because the
15 speech recognition and identification system has to only identify a few parameter files for any one physical address, resulting in a very high probability of recognizing a specific speaker's speech.

Financial transaction security, e.g. speech banking and e-commerce, can be realized with this system and, with the addition of speech encryption
20 processing in the Speech Preprocessor, even higher levels of security can be attained. This directly supports a method of contracting based upon an offer presented to the user by the system, and a recognizable acceptance of the offer by the identified user. The method of contracting may further include storing the offer and acceptance as a recording mechanism for the contract.

The speech signal transmitted from a subscriber's set-top box, or set-top appliance, 1100 is received 1510 by the five to 40 MHz data receiving equipment within gateway 3100 in the central location. As used herein, a central location may include a node, Headend, or metropolitan Headend for a residential broadband network.

When the digitized speech signal comes from a commercial set-top box, such as a General Instruments or a Scientific Atlanta set-top, then the return path receiving equipment in the central location may be specific to that type of box. Therefore, the data coming from this equipment, which contain other upstream traffic, may be parsed in such a way that only the speech commands and address information from the subscriber are input to the speech recognition engine in the central location.

When the digitized speech signal sent upstream comes from another set-top appliance, the upstream data receiver in the central location may be a separate unit that receives only speech command signals from set-top appliances at the user sites. Using the set-top appliance as the upstream transmitter allows the use of custom upstream protocols such as FM, AM, PSK, or spread spectrum digital transmission. Digital transmission techniques such as QPSK or QAM can also be employed.

Upon receiving the digitized and preprocessed speech signal from the subscriber's set-top box or set-top appliance, the received upstream signal may be in the form of a data stream containing speech and address information. The data stream containing speech and address information may be Ethernet compatible. Because the AgileTV™ Voice Processing Unit (AVPU) is a high speed speech processing unit capable of processing the

data from several nodes, the digital speech signals from each of these nodes may be combined in the AVPU input multiplexer. The combining of digital speech signals may result in a smaller number of high speed digital streams.

Upstream signals such as **1510** are received at the gateway **3100**. Speech and data signals may be received from commercial return path data receivers. Speech and data signals are also received and decoded by custom return path receivers using at least one of the following protocol options: FM or AM modulation/demodulation, FDMA, TDMA, FSK, PSK, or QPSK digital modulation/demodulation, Spread Spectrum modulation/demodulation, Telephony, cellular return, or Wireless.

The AVPU Engine may not be an application service, in and of itself. The system may provide new end user applications. The AVPU Engine may provide speech recognition and control services for existing applications, such as Interactive Program Guides, Video On Demand (VOD) services or access to the Internet or World Wide Web.

Near network system initialization time, applications such as Video On Demand or Interactive Program Guides, that request service access with the speech recognition services may be required first to register with the AVPU system. At least one standard program interface may then be used to enable each application to specify its complete menu hierarchy. The invention may use exactly one standard program interface to enable applications to specify their complete menu hierarchy.

A list structure specifies each application's menu hierarchy. This list structure may be a tree. It contains labels for each menu, along with the text of each

button on each menu screen, information the system needs to provide speech navigation services independently through the menu hierarchy on behalf of the application. This menu hierarchy represents the static portion of the application's data.

5 In addition to the static menu structure, it may also be the responsibility of the application to inform the system of dynamic content, for example the names of movies in a Video On Demand system or of program names and times in an interactive program guide. Each time a user enters a menu context in which dynamic content appears, the application may inform the speech system of
10 this context by passing a handle associated with the list of names that comprise the dynamic content. The speech system may combine the static menu content with the augmented dynamic content (see Similarity Searching below), to form a complete grammar. Also, application-independent keywords, such as HELP, may be combined with the static menu content and
15 augmented dynamic content to form the complete grammar. This construct may then be passed to the speech system to maximize recognition accuracy.

Given that dynamic content, by definition varies, applications may be required to inform the system whenever the content changes. In an interactive TV guide application, for example, the application registers a new set of dynamic
20 content every one-half hour. For a VOD system, this registration may be performed whenever the database of offered movies changes.

Once registration has been completed, and the system is being used, recognition of a spoken request may cause a signal to be sent back to the application. This signal informs the application to perform the requested
25 action, and/or to update the contents of the screen as a result of the user's

request. In this manner, the application can use the system's speech recognition services with minimal modifications to the application's code, while retaining the same graphical look and feel to which users have become accustomed.

5 In the subscriber's premises, a speech-enabled remote control may be employed, e.g. containing a microphone, as well as traditional universal remote control functionality. The remote control may further contain a Push-To-Talk (PTT) button. Conventional remote control functions are transmitted via infra-red (IR). The speech output may be wirelessly transmitted to a set
10 top pod, module, or appliance located at the set-top box. The wireless transmission from the remote control may employ an electromagnetic physical transport layer or ultrasonic physical transport layer. The electromagnetic physical transport layer may use a radio frequency carrier or an infra-red carrier.

15 When the PTT button is pushed by the user, the remote control sends a PTT active command to the set top appliance. The appliance may then inform the set-top box to place an icon on the screen, or otherwise indicate to the user that the system is listening to them. Next, as the user speaks into the microphone, the speech is digitized, compressed, and transmitted to the set
20 top appliance.

The set top appliance may perform any or all of the following: encrypt the speech sample to provide security; add subscriber address information; add a message length code; add error control coding to the assembled information. The error control coding may include a Cyclical Redundancy Code (CRC),
25 enabling data transmission errors to be detected.

In homes with set-top boxes having the necessary features, the set top appliance may transmit speech information to the set-top box, which then transmits it to the central location as a series of packets.

Alternatively, the set top appliance may directly transmit the speech stream to the central location itself. This may continue until the set top appliance receives a PTT Release from the remote, indicating end of speech. This information is also transmitted to the central location, signaling end of spoken request.

Each individual consumer's interface, i.e. set-top box or set-top appliance, may have a unique address. The address of the individual consumer's interface may be determined during the manufacturing process. As speech packets are transmitted upstream, this address information may be appended to the speech packets. The address information enables rapid determination of the user site from which the speech sample is received. The address information may precede the speech packets. The address information improves the efficiency of at least some of the central location processing stages.

Assignment of an input buffer address to the speech sample may be based upon the user site address. This input buffer collects incoming speech packets until the final packet of a spoken request has been received. Recognition of the final speech packet receipt may be encoded in that speech packet. Final speech packet receipt recognition may include a delay in speech of greater than a predetermined amount of time. The speech delay amount may be one or more of at least the following: a globally defined constant, a user site defined constant, an identified user defined constant, or an

application-defined constant for an application serviced by the speech recognition system. The final speech packet may be generated based upon the release of the PTT button in the remote control unit. The final speech packet may be generated at the remote control unit, set top pod, set top appliance, set top box, node, Headend or metropolitan Headend, or by the serviced application. The final speech packet may be generated by the serviced application based upon a time schedule, e.g. a fixed period in which participants may respond, a privilege scheme, and/or other application related scheme.

On-the-fly Cyclical Redundancy Code (CRC) error checking generation may be used. Each time a packet is read in, CRC in the processor registers may be computed as each byte is read, then the partial CRC is stored with the stored packet. The CRC may be stored at the end of the packet, at the beginning of the packet or in specifically designated locations within the packet. When the next packet arrives, the partial CRC is read from where it was stored, and the new packet data may be appended to the end of the previous packet, overwriting the temporary CRC. This continues until a complete speech sample has been received. This approach to CRC calculation cuts memory accesses in half compared to first storing the string, then making a second pass to generate the CRC.

Once a complete spoken request has been received, the speech input processor may use the sample's source address identifying a user site to target the speech data to a specific speech processing processor. This direct correspondence between the source address and a specific speech processor allows speech processors to cache user-specific parameters for the user sites

they serve. The mapping of source addresses to speech processor reduces the bandwidth necessary to move user site-specific data to each speech processor. In other embodiments of the invention, a translation table may be used to allow speech to processor assignments to be changed dynamically in the event of a hardware or other failure, e.g. capacity overload, while retaining the efficiency advantages of directly mapping the speech channel to the processor.

To process a speech sample by the speech processor into speech content, the speech processor must first contain in its local memory a copy of the grammar definition associated with the user site. A grammar is a structure often containing the words which are most likely to be spoken, the order in which these words may appear, and the meaning of various sequences of words. This structure may be a hardware configuration, software program, data structure, or a combination of two or more of these.

Before transferring the new speech sample to a speech processor, the grammar associated with the speech sample is transferred to the target speech processor. The grammar transfer may use a simple Least Recently Used (LRU) queue. If the speech processor contains enough empty space in its memory, then the indicated grammar is transferred directly to the empty memory from mass storage. Mass storage may include, but is not limited to, a disk, disk farm, or Redundant Array of Independent Disks (RAID), a high bandwidth disk farm. If not, then the least-recently-used grammar entry may be discarded, and the new grammar information loaded into the vacated memory.

The next step in processing the speech sample ensures that the current parameters associated with this user site are already cached in the specific speech processor's RAM. If these parameters are not present, then the least-recently-used parameter cache entry may be evicted from the cache.

5 To do this, the oldest cache entry on this speech processor is first examined to see if it has been modified. If it has, the cache entry is stored to mass storage, and the cache slot is then declared vacant. Next, the user site speech parameters associated with the new speech sample are loaded into the vacated cache block. During the relatively long access times needed to
10 load a new set of user site parameters from mass storage (and optionally to write the old parameters to the disk, etc.), the current speech sample may be held in the input buffer in a waiting state.

After the new household speech parameters are loaded into the targeted speech processor, the speech sample is moved into the work queue for the
15 speech processor. This minimizes speech processor delay for processing other speech requests during disk accesses. Instead, the speech processor may process other speech samples associated with user sites whose parameters are already in the cache.

Once the speech parameters associated with a speech sample are available
20 in the speech processor, the speech sample may be assigned to the speech processor by placing a description of the speech sample into the target speech processor's work queue. As speech samples are processed, they may be removed from the front of the work queue by the speech processor.

Eventually, the speech processor reaches the current input sample. The speech sample is transferred into the speech processor's local memory, and the status of this speech sample changed to Next. This transfer may occur in parallel with the processing of the prior speech sample, ensuring that speech processor utilization is maximized.

Once this transfer is complete, and the speech processor completes processing of the prior sample, the status of this speech sample changes to Current, and the speech recognition engine begins processing this sample.

Successful processing of a speech sample requires that both the proper grammar and the proper user site parameter information be simultaneously accessible by the speech processor.

The possibility exists in which a recently-loaded grammar or speech parameter file is erased prior to its use, in the process of loading the grammar or speech parameters for the current speech sample. To eliminate this condition, the total number of speech samples sitting in the waiting and working queues of a speech processor preferably should not exceed the number of cache entries in the speech processor.

The first step in recognizing the current speech sample may determine which individual person pronounced the current spoken request. The Speaker Identification software module running on the targeted speech processor compares the spoken characteristics of this speech sample with the characteristics of the speakers who have been previously identified in this user site.

In many spoken requests, the incoming speech sample matches the characteristics of a previously identified speaker. When this occurs, the speech sample is passed on to the next phase, speech recognition.

If the speech sample is not identified with an existing speaker, then a new user routine is invoked, enabling a new user to be associated with this household. This routine records the new individual's speech parameters into this user site's speech parameters, so that the new speaker may be identified during subsequent spoken requests. Optionally, the system may offer the user site manager the opportunity to erase or modify the new speaker parameters.

The inputs to the speech recognition software module may include a speech sample, an individual user's speech parameters, and the grammar to be recognized. The speech engine determines the most likely spoken request based on statistical analysis, and may return a text string corresponding to the spoken request. This matching process is probabilistic: along with the returned text string, the speech engine may also return a confidence measure, or percentage of match likelihood. The returned text string and confidence measure enables different applications to respond differently based on the calculated confidence in the recognition result.

For recognition results having a low cost to the user, such as a request to display listings for a particular movie, lower confidence criteria may be applied. For recognition results with a high cost to the user, such as a request to purchase a movie, higher confidence thresholds may be required. Furthermore, purchase verification may be requested.

When recognition accuracy is particularly low, the speech recognition engine may determine partial matches to more than one possible phrase, returning the text of several possible matches. This process enables an application or user to select from several alternative recognition results.

5 In cases where a transaction results in a charge to the user, the system may record the speech sample representing the purchase request onto mass storage. This speech sample recording is performed to provide verification that a purchase request was made, should a user dispute their intent to purchase. This further supports speech-based methods of contracting. Note
10 that the recording may be compressed in either a standard or non-standard manner, which may further include encryption technology.

Due to the statistical nature of speech recognition, spoken requests are occasionally mis-recognized. Recognition errors have been a primary hindrance to further exploitation of speech recognition systems. This system
15 provides a mechanism by which the user receives rapid visual feedback regarding the recognition process. Soon after the speech recognition engine has returned a result, visual text corresponding to the recognized spoken request is displayed on the display, e.g. television, screen.

This rapid visual feedback may be accomplished by transmitting the
20 recognized text string back to the set-top box. Software executing within the set-top box displays the text information in a special window on top or overlaying of the existing application display. In cases where limitations in the set-top box prevent the window from appearing on top of existing content, software executing within the set-top box may select an alternative feedback

display, for example, a different channel containing a background field, and displays the overlay information on top of this background.

In cases where the recognition accuracy is particularly poor, and the speech engine returns several possible recognition results, this overlay display capability may be used to help refine the user's query. By displaying the text of the possible recognition results, the user can easily select from the returned list.

If none of the recognized text strings match the user's spoken request, the user may elect to start again. However, more commonly, one of the displayed strings match, or be likely to readily lead to the user's speech request with appropriate modification. When this is the case, the user can readily select from the displayed alternatives, enabling improved productivity in low-recognition situations.

One key feature which can be used with applications such as Pay-Per-View and Video-On-Demand, is similarity searching. When the system is scanning for dynamic content, i.e. movie titles and actor names, a similarity search feature may be available. This enables searches for names which are only partially matched, or which resemble the recognized phrase, without requiring precise specification of the exact title or name. The technique used to deliver similarity searching is to augment the dynamic content list specified by the application. Words similar in meaning, content, or spelling to words in the content list may be automatically added to the dynamic content list whenever the application informs the system of a content update. This enables the recognition grammar to be extended to support a broader array of matches without requiring bandwidth-intensive text searches each time a user's speech

request has been received. Links between similar and target words may be maintained in the internal representation of the grammar, thereby providing direct access to target names. This further enhances system performance.

Note that as used herein, similarity databases may be constructed from at least one or more of the following database architectures: relational, SQL, knowledge-based, inferential knowledge bases including Horn clause and extended Horn clause fact bases, fuzzy versions of the above, as well as neural networks and combinations of these techniques. Also, manual additions may be made at the AgileTV™ central office.

The entire system may provide fault tolerance for robust performance. For individual components, such as speech processors and associated memory, the system may automatically recognize most component failures, and disable faulty processors.

In addition, many system installations may require multiple AgileTV™ Voice Processing Unit (AVPU) boxes **3000** to meet the performance needs of the subscriber base. To ensure maximum operating time, even the total failure of an AVPU engine may not be catastrophic. The remaining AVPU engines continue to service the incoming speech traffic at a reduced performance level. This failover is carried out by a negotiation protocol between the AVPU boxes.

In addition to these internal diagnostics functions, the system may also communicate continuously with a network operations center, enabling rapid identification of system errors, as well as rapid service dispatch to correct any problems.

A speech command preprocessor may perform the function of speech filtering, digitizing, data compression, encoding pauses in speech, and address insertion. Preprocessing speech commands at user sites results in a lower upstream data rate. This processing can be located in the remote 1000,
5 the Set-top appliance 1100, or the set top box.

A Speech Packet Processor may be centrally located in or near a wireline node specifically to capture and prepare the upstream speech packets that are to be fed to the Speech Recognition Engine.

A speech processor system may be centrally located in or near a wireline
10 node, which may include a Cable Television (CATV) central location. The speech recognition system may be centrally located in or near a server farm. The speech recognition system may be centrally located in or near a web-site hosting location. The speech recognition system may be centrally located in or near a gateway.

15 The speech recognition engine processes speech packets to create speech content and formulate the response to the speech content for each of the user sites.

The system also performs address decoding for routing and latency reduction. It also performs the function of decoding the pauses between words or
20 sounds originally encoded on the preprocessor at the user site.

A method is provided for a very high level of security based on the ability of being able to precisely recognize a parent's speech or a child's speech based on a limited subset of choices. The ability to recognize an individual speaker

with a very high probability of identifying the specific speaker is based on knowing the address of the user site.

A large capacity, centrally located, natural speech recognition engine can readily identify a specific speaker from among a small set of choices, allowing a parent to voice print and therefore control the type, or amount or timing of content a child may request. A child may be able to learn PIN numbers but cannot readily fool the voice print. Speaker recognition is particularly appealing in this parental control application, and can be applied with very high accuracy, due to the limited number of speakers per user site. Parents may control the specific viewing times, total time, or content that a child can watch television through this system and its use.

The operational discussion just presented regarding Figures 3-5 is applicable to the relevant operational system embodiments based upon any and all of the Figures 19A to 24, as well as, Figures 26 to 31.

A parallel processor system supporting this sort of system is disclosed in U.S. Patent Application Serial Number 60/210,440, entitled "System and Method of a Multi-dimensional Plex Communication Network", which describes plex processor networks and which is incorporated herein by reference.

A plex communications network has M orthogonal directions that support communications between an M dimensional lattice that may include N^M plex-nodes, where M is at least two and N is at least four. Each plex-node pencil in a first orthogonal direction contains at least four plex-nodes and each plex-node pencil in a second orthogonal direction contains at least two plex-nodes. Each of the plex-nodes contains a multiplicity of ports.

A plex-node pencil refers to a 1-dimensional collection of plex-nodes differing from each other in only one dimensional component, i.e. the orthogonal direction of the pencil. By way of example, a nodal pencil in the first orthogonal direction of a two-dimensional array contains the plex-nodes differing in only the first dimensional component. A nodal pencil in the second orthogonal direction of a two-dimensional array contains the plex-nodes differing in only the second dimensional component.

The plex communications network is comprised of a communication grid interconnecting the plex-nodes. The communications grid may include $N^{(M-1)}$ communication pencils, for each of the M directions. Each of the communication pencils in each orthogonal direction is coupled with a corresponding plex-node pencil containing a multiplicity of plex-nodes coupling every pairing of plex-nodes of the corresponding plex-node pencil directly.

Communication between two plex-nodes of a nodal pencil coupled with the corresponding communication pencil comprises traversal of the physical transport layer(s) of the communication pencil.

Such plex communications networks support direct communication between any two plex-nodes belonging to the same communication pencil. This supports communication between any two plex-nodes in at most M hops between plex-nodes.

Figure 6 depicts a tightly coupled server farm **3000** of Figure 3 implemented in a two-dimensional plex communication network with $N=4$ plex-nodes in each of two orthogonal directions of the plex-node array.

Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,0, Plex-node 1,0, Plex-node 2,0 and Plex-node 3,0. The communication pencil **400** in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,0 is coupled **402** to communication pencil **400**. Plex-node 1,0 is coupled **404** to communication pencil **400**. Plex-node 2,0 is coupled **406** to communication pencil **400**. Plex-node 3,0 is coupled **408** to communication pencil **400**.

Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,1, Plex-node 1,1, Plex-node 2,1 and Plex-node 3,1. The communication pencil **410** in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,1 is coupled **412** to communication pencil **410**. Plex-node 1,1 is coupled **414** to communication pencil **410**. Plex-node 2,1 is coupled **416** to communication pencil **410**. Plex-node 3,1 is coupled **418** to communication pencil **410**.

Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,2, Plex-node 1,2, Plex-node 2,2 and Plex-node 3,2. The communication pencil **420** in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,2 is coupled **422** to communication pencil **420**. Plex-node 1,2 is coupled **424** to communication pencil **420**. Plex-node 2,2 is coupled **426** to communication pencil **420**. Plex-node 3,2 is coupled **428** to communication pencil **420**.

Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,3, Plex-node 1,3, Plex-node 2,3 and Plex-node 3,3. The communication pencil **430** in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,3 is coupled **432** to

communication pencil **430**. Plex-node 1,3 is coupled **434** to communication pencil **430**. Plex-node 2,3 is coupled **436** to communication pencil **430**. Plex-node 3,3 is coupled **438** to communication pencil **430**.

Three of these ports on each plex-node are devoted to providing a direct
5 interconnect to the other plex-nodes of its row through a collection of communication paths forming the communication pencil in the second orthogonal direction. These plex-nodes belong to the same row as the plex-nodes of the plex-node pencil in the second orthogonal direction.

A plex-node may have at least one additional port. At least one of the
10 additional ports may be connected to an external network. Further, at least one of the additional ports may be connected to an external mass storage system. In other embodiments of the invention, at least one of the additional ports may be connected to an external database system.

A plex-node may contain at least one instruction processor. As used herein,
15 an instruction processor includes but is not limited to instruction set processors, inference engines and analog processors. An instruction set processor refers to instruction processors changing state directly based upon an instruction, and which change an internal state by executing the instruction. The instruction may include, but is not limited to, direct or native
20 instructions and interpreted instructions. An inference engine changes state when presented an instruction, which may include an assertion, an assumption, or an inference rule. Inference engines include, but are not limited to, Horn clause engines such as Prolog requires, constraint based systems and neural network engines. As referred to herein, analog
25 processors include, but are not limited to, optical signal processors, CCD's,

and resonant cavity devices responding to data and/or controls asserted in the analog domain.

Communication includes, but is not limited to, communication using a digital communications protocol. Communication also includes a messaging protocol using the digital communications protocol. Communications also includes a messaging protocol supporting TCP-IP, supporting the Internet, and/or supporting the World Wide Web.

Communications may also include at least one video stream protocol using a digital communications protocol. Communications may include at least one multi-media stream protocol using the video stream protocols including motion JPEG and/or at least one form of MPEG.

The invention may support Wavelength Division Multiplex (WDM) through the physical transport of the communication paths of the communication pencils.

Each plex-node may include a communication processor. Each plex-node may further include M communications processors. The ports of each communications processor may be connected to each one of the pencils supporting pencil communications processing.

Figure 7 depicts a gateway **3100** of Figure 3 implemented in a two-dimensional plex communication network with N=4 plex-nodes in each of two orthogonal directions of the plex-node array.

In Figures 6 and 7, upstream signals **1510** may be received at the Plex-node 0,0, performing functions similar in nature to processor node **3110** of Figures 3, 4 and 5. Plex-node 0,1 may couple **3142** to RAID **3130** subsystem,

providing high-speed access to a high capacity disk farm. Various signals **1512** to **1518** may be generated by various plex-nodes. Note that because of the uniformity of the communication structure, there is great flexibility in choosing which plex-node generates which communication signals.

5 Figure **7** also shows coupling **3002** to a speech recognition server array **3200**.

Figure **8** depicts a coupled server array **3200** of Figure **3** implemented in a two-dimensional plex communication network with $N=4$ plex-nodes in each of two orthogonal directions of the plex-node array.

Each plex-node of Figure **8** may include a plex communications network
10 supporting a two or more dimensional array of internal plex-nodes, each including at least one instruction processor.

Figure **9** depicts a simplified block diagram using an array of processors as shown as **3200** in Figure **3**.

Consider an array of plex-nodes, where each plex-node uses multiple-
15 processor IC's labeled **CPU**. Each CPU may possess three or more high speed serial protocol channels **C1-3**, a high speed interconnect bus **B1**, a low speed interconnect bus **PCI** and a local memory access bus **R**. Each CPU may include at least two processors. Each processor may be an instruction processor. Each CPU may be an integrated circuit. The integrated circuit may
20 be a BCM12500 manufactured by Broadcom Corporation of Irvine, California.

CPU1 and **CPU2** are locally coupled via at least one of the interconnect buses. Each CPU possesses locally accessible memory via an **R** bus. Each CPU may further access locally accessible memory via its own **R** bus. The **R**

bus accessed memory may include DDR SDRAM (Double Data Rate Synchronous DRAM).

Three serial protocol channels for the first CPU of each CPU pair are dedicated to communication within each row of CPU pairs. Three serial
5 protocol channels for the second CPU of each CPU pair are dedicated to communication within each column of CPU pairs.

Assume each CPU contains at least two processors. Assume each processor is operating at K billion integer operations/second and L billion floating point operations/second. Assume the high speed serial channels support a
10 gigabit/second bidirectional transfer rates. The DDR DRAMs support M gigabyte/second access rates. This system provides $64 \cdot K$ billion integer operations, $64 \cdot L$ billion floating point operations, 128 gigabits/second interconnect communication bandwidth throughout the array through the high speed serial channels, as well as $64 \cdot M$ gigabytes/second local memory
15 access. By decoupling the tasks running on each processor, making them independent and concurrent, this system architecture achieves the dream of Multiple-Instruction Multiple Datapath computing (MIMD), providing essentially linear speed up with the increase in processors for up to 64 processors.

Such architectures can support each processor generating a frame in a local
20 frame buffer and rendering it into a motion video stream, which is merged into a multiplexed video content stream suitable for a variety of multi-media applications. This apparatus meets or exceeds the requirements of a number of teraflop-class computing applications, which today have no cost effective solution. Note that the processors may each be dual instruction processors
25 housed in a single package.

Each of these arrays will process over 1K speakers concurrently and fit into a single rack mount enclosure. Standard 72 inch, tall racks could then hold 4 such speech engines, also known herein as an AVPU, supporting up to 140,000 subscribers. Each server contains at least dual, redundant, hot-swappable power supplies, and redundant, hot-swappable disks with automatic recovery for failed disk drives. The hot-swappable power supplies may further be half-sized, each supporting the power requirements of half the server engine.

Real-time, extensive diagnostics and continuous connectivity to a 24 hours per day, seven days per week (24x7) Network Operations Center insuring timely failure detection and service dispatch. In systems with more than one speech engine, the server automatically handles catastrophic failures gracefully. Even if an entire speech engine fails, the remaining ones pick up the workload.

Figure 10 depicts a flowchart of a method that uses a back channel containing a multiplicity of identified speech channels for speech recognition at a wireline node in a network supporting video or cable television delivery in accordance with the invention. The back channel is from a multiplicity of user sites and is presented to a speech processing system at the wireline node in the network.

The speech processing system performs the operations of the method.

Operation 2000 starts the operations of this flowchart. Arrow 2002 directs the flow of execution from operation 2000 to operation 2004. Operation 2004 performs receiving the back channel to create a received back channel. Arrow 2006 directs execution from operation 2004 to operation 2008.

Operation 2008 terminates the operations of this flowchart.

Arrow **2010** directs the flow of execution from starting operation **2000** to operation **2012**. Operation **2012** performs partitioning the received back channel into a multiplicity of received identified speech channels. Arrow **2014** directs execution from operation **2012** to operation **2008**. Operation **2008** terminates the operations of this flowchart.

Arrow **2020** directs the flow of execution from starting operation **2000** to operation **2022**. Operation **2022** performs processing the multiplicity of the received identified speech channels to create a multiplicity of identified speech content. Arrow **2024** directs execution from operation **2022** to operation **2008**. Operation **2008** terminates the operations of this flowchart.

Arrow **2030** directs the flow of execution from starting operation **2000** to operation **2032**. Operation **2032** performs responding to the identified speech content to create an identified speech content response, for each of the multiplicity of the identified speech contents. Arrow **2034** directs execution from operation **2032** to operation **2008**. Operation **2008** terminates the operations of this flowchart.

Portions of the flowchart of Figure **10** related to operations **2022** and **2032** may operate a speech processing system coupled to a wireline node in a network. The wireline node provides multiple received identified speech channels to the speech processing system. The received identified speech channels are based upon a received back channel at the wireline node from multiple user sites coupled to the network. The network supports video delivery to the user sites and/or cable television delivery to the user sites.

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The speech processing system may include at least one computer. Operations **2022** and **2032** may be implemented as program steps of a program system operating at least part of the computers included in the speech processing system. Implementations of these operations as program
5 steps may reside in memory accessibly coupled to at least one computer in the speech processing system.

Note that operations **2002** and **2012** may be implemented in hardware and/or implemented as program steps used in operating computers located at the wireline node. Such computers may or may not be part of the speech
10 processing system.

At least one, and possibly all, of the identified speech channels may have an associated user site.

Figure **11A** depicts a detail flowchart of operation **2012** of Figure **10** further partitioning the received back channel.

15 Arrow **2070** directs the flow of execution from starting operation **2012** to operation **2072**. Operation **2072** performs partitioning the received back channel into a multiplicity of received identified speech channels from the associated user site. Arrow **2074** directs execution from operation **2072** to operation **2076**. Operation **2076** terminates the operations of this flowchart.

20 Figure **11B** depicts a detail flowchart of operation **2022** of Figure **10** further processing the multiplicity of the received identified speech channels.

Arrow **2090** directs the flow of execution from starting operation **2022** to operation **2092**. Operation **2092** performs processing the multiplicity of the

received identified speech channels from the associated user site to create multiple identified speech contents. Arrow **2094** directs execution from operation **2092** to operation **2096**. Operation **2096** terminates the operations of this flowchart.

- 5 Figure **11C** depicts a detail flowchart of operation **2032** of Figure **10** further responding to the identified speech content.

Arrow **2110** directs the flow of execution from starting operation **2032** to operation **2112**. Operation **2112** performs responding to the identified speech content from the associated user site to create the identified speech content response for the associated user site. Arrow **2114** directs execution from operation **2112** to operation **2116**. Operation **2116** terminates the operations of this flowchart.

Figure **12** depicts a detail flowchart of operation **2000** of Figure **10** further performing the method using the back channel from multiple user sites.

- 15 Arrow **2120** directs the flow of execution from starting operation **2000** to operation **2122**. Operation **2122** performs determining the associated user site from the received identified speech channel. Arrow **2124** directs execution from operation **2122** to operation **2126**. Operation **2126** terminates the operations of this flowchart.

- 20 Arrow **2130** directs the flow of execution from starting operation **2000** to operation **2132**. Operation **2132** performs determining the associated user site from the identified speech content. Arrow **2134** directs execution from operation **2132** to operation **2126**. Operation **2126** terminates the operations of this flowchart.

Arrow **2140** directs the flow of execution from starting operation **2000** to operation **2142**. Operation **2142** performs determining the associated user site from the identified speech content and a speaker identification library. Arrow **2144** directs execution from operation **2142** to operation **2126**.

5 Operation **2126** terminates the operations of this flowchart.

Arrow **2150** directs the flow of execution from starting operation **2000** to operation **2152**. Operation **2152** performs determining the associated user site from the identified speech content and a speech recognition library. Arrow **2154** directs execution from operation **2152** to operation **2126**.

10 Operation **2126** terminates the operations of this flowchart.

Arrow **2160** directs the flow of execution from starting operation **2000** to operation **2162**. Operation **2162** performs determining the associated user site from an identification within the speech channel. Arrow **2164** directs execution from operation **2162** to operation **2126**. Operation **2126** terminates

15 the operations of this flowchart.

Note that the determination of the associated user site may be provided by an identification within the speech channel. By way of example, a technician may be recognizable at many user sites, and may identify the user site as Room 432 or 10 Main Street in the process of activities at that user site.

20 The invention can include at least one of the operations **2120**, **2132**, **2142**, **2152** and **2162**.

Figure **13A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to identified speech contents.

Arrow **2170** directs the flow of execution from starting operation **2112** to operation **2172**. Operation **2172** performs processing the identified speech content response to create the identified user site response. Arrow **2174** directs execution from operation **2172** to operation **2176**. Operation **2176** performs sending the identified user site response to the identified user site. Arrow **2178** directs execution from operation **2176** to operation **2180**. Operation **2180** terminates the operations of this flowchart.

Figure **13B** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content.

Arrow **2190** directs the flow of execution from starting operation **2112** to operation **2192**. Operation **2192** performs assessing the speech content response identified as to the user site to create a financial consequence identified as to the user site. Arrow **2194** directs execution from operation **2192** to operation **2196**. Operation **2196** performs billing the user site based upon the financial consequence. Arrow **2198** directs execution from operation **2196** to operation **2200**. Operation **2200** terminates the operations of this flowchart.

Figure **14** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2210** directs the flow of execution from starting operation **2112** to operation **2212**. Operation **2212** performs assessing the speech response to create a financial consequence identified as to the user site. Arrow **2214** directs execution from operation **2212** to operation **2216**. Operation **2216** performs displaying the financial consequence to create a displayed financial

consequence at the user site. Arrow **2218** directs execution from operation **2216** to operation **2220**. Operation **2220** performs confirming the displayed financial consequence from the user site to create a financial commitment. Arrow **2222** directs execution from operation **2220** to operation **2224**.
5 Operation **2224** performs billing the user site based upon the financial commitment. Arrow **2226** directs execution from operation **2224** to operation **2228**. Operation **2228** terminates the operations of this flowchart.

Figure **15A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

10 Arrow **2250** directs the flow of execution from starting operation **2112** to operation **2252**. Operation **2252** performs identifying a user based upon the speech content identified with the user site to create an identified user. Arrow **2254** directs execution from operation **2252** to operation **2256**. Operation **2256** terminates the operations of this flowchart.

15 Figure **15B** depicts a detail flowchart of operation **2252** of Figure **15A** further identifying the user.

Arrow **2270** directs the flow of execution from starting operation **2252** to operation **2272**. Operation **2272** performs fetching a user profile list based upon the user site and the user profile list containing at least one user profile.

20 Arrow **2274** directs execution from operation **2272** to operation **2276**. Operation **2276** performs identifying the user based upon the speech content and based upon the user profile list to create an identified user. Arrow **2278** directs execution from operation **2276** to operation **2280**. Operation **2280** terminates the operations of this flowchart.

Figure **16** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2290** directs the flow of execution from starting operation **2112** to operation **2292**. Operation **2292** performs assessing the speech response based upon the identified user to create a financial consequence for the identified user. Arrow **2294** directs execution from operation **2292** to operation **2296**. Operation **2296** performs displaying the financial consequence to create a displayed financial consequence at the user site. Arrow **2298** directs execution from operation **2296** to operation **2300**.

Operation **2300** performs confirming the displayed financial consequence from the user site based upon the identified user to create a financial commitment. Arrow **2302** directs execution from operation **2300** to operation **2304**. Operation **2304** performs billing the identified user based upon the financial commitment. Arrow **2306** directs execution from operation **2304** to operation **2308**. Operation **2308** terminates the operations of this flowchart.

Figure **17A** depicts the speech content response **2350**, including the current response menu **2352** and the cumulative user site response **2354**, in accordance with the invention.

The speech content response may include a current response menu and a cumulative user site response identified as to the user site for at least one of the user sites.

Figure **17B** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2330** directs the flow of execution from starting operation **2112** to operation **2332**. Operation **2332** performs responding to the speech contents based upon the current response menu and based upon the cumulative user site response to create a new cumulative user site response. Arrow **2334** directs execution from operation **2332** to operation **2336**. Operation **2336** terminates the operations of this flowchart.

Arrow **2340** directs the flow of execution from starting operation **2112** to operation **2342**. Operation **2342** performs assessing the speech contents based upon the current response menu and based upon the cumulative user site response to create a new current response menu. Arrow **2344** directs execution from operation **2342** to operation **2336**. Operation **2336** terminates the operations of this flowchart.

At least one of operations **2332** or **2342** may be performed.

Figure **18A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2370** directs the flow of execution from starting operation **2112** to operation **2372**. Operation **2372** performs responding to the speech content, identified as to the user site, based upon a natural language, to create a speech content response of the speech content identified as to user site. Arrow **2374** directs execution from operation **2372** to operation **2376**. Operation **2376** terminates the operations of this flowchart.

Figure **18B** depicts a detail flowchart of operation **2092** of Figure **11B** further processing the multiplicity of the received speech channels.

Arrow **2390** directs the flow of execution from starting operation **2092** to operation **2392**. Operation **2392** performs processing the received speech channels from the user site based upon a natural language for the user site to create the speech content identified as to the user site. Arrow **2394** directs execution from operation **2392** to operation **2396**. Operation **2396** terminates the operations of this flowchart.

Figure **19A** depicts a simplified block diagram of a hand held remote **1000**, containing microphone **1060** and keypad **1020** supporting user input organized and processed by embedded controller **1050** for communication by wireless interface **1040** coupled **1002** to set-top apparatus **1100**, as shown in Figure **3**.

Figure **19B** depicts a simplified block diagram of set-top apparatus **1100** as shown in Figure **3** showing coupling **1002** and first wireline physical transport **1200** comprised of downlink coupling **1202** and uplink coupling **1204**.

Note that microphone **1060** may include more than one audio-sensor and/or a microphone array of two or more microphone units.

Figure **19C** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000**. Set-top appliance **1120** is coupled **1112** with set-top box **1110** possessing downlink coupling **1202** and uplink coupling **1204**.

Figure **19D** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000** and possessing downlink coupling **1202** and uplink coupling **1204**. Set-

top appliance **1120** provides processed downlink coupling **1114** to set-top box **1110** and receives initial uplink coupling **1112** from set-top box **1110**.

Regarding Figure **19A-19D**, the following observations may be made.

The invention supports uni-directional communication via coupling **1002**, supporting communicative transfer from the remote **1000** via coupling **1002** to set-top apparatus **1100**.

The invention supports bi-directional communication via coupling **1002**. Note that noise-canceling microphones **1060** may use bi-directional communication on coupling **1002**. Noise cancellation may be performed within set-top apparatus **1100**, by at least one of the set-top box **1110** and set-top appliance **1120**.

Wireless interface **1040** interacts with coupling **1002**. Coupling **1002** may use a wireless transport, including, but not limited to, at least one of infra-red, microwave or radio frequency spectrum regions, as well as ultrasonic signaling. Embedded controller **1050** controls **1042** wireless interface **1040**. Embedded controller **1150** communicates via **1042** with wireless interface **1040** to direct communication across coupling **1002**.

Figure **20A** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19C** supporting coupling **1002** with hand held remote **1000** and coupling **1112** with set-top box **1110**.

Computer **1150** is coupled **1132** to remote interface **1130** and also coupled **1142** to set-top box interface **1140**. Computer **1150** executes a program

system including program steps residing in accessibly coupled **1162** memory **1160**.

The program system executed by computer **1150** includes program steps maintaining hand held remote **1000** communication through remote interface **1130** and maintaining set-top box **1120** communication through set-top box interface **1140**.

Remote interface **1130** couples **1002** with hand held remote **1000** (not shown in Figure **20A**).

Remote interface **1130** incorporates the necessary device or devices to provide communications using the embodiment's physical transport layer.

Set-top box interface **1140** couples **1112** with set-top box **1120**, as shown in Figure **19C**. Coupling **1112** may use a wireline or wireless physical transport. Coupling **1112** may use a wireless transport, including, but not limited to, at least one of the infra-red, microwave or radio frequency spectrum, as well as ultrasonic signaling. Set-top box interface **1140** incorporates the necessary device or devices to provide communications using the embodiment's physical transport layer.

Figure **20B** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19D** supporting coupling **1002** with hand held remote **1000** and couplings **1112** and **1114** with set-top box **1110**.

Set-top box interface **1140** provides processed downlink coupling **1114** to set-top box **1110** and receives initial uplink coupling **1112** from set-top box **1110**

as shown in Figure 19D. Set-top box interface 1140 incorporates the necessary device or devices to provide these communications.

Figure 20C depicts a block diagram further depicting accessibly coupled 1162 memory 1160 as shown in Figures 20A and 20B.

- 5 Accessibly coupled 1162 memory 1160 may contain RAM memory 1180 coupled 1182 to computer 1150. Accessibly coupled memory 1160 may include more than one RAM memory 1180. Distinct RAM memories 1180 may be distinctly coupled to computer 1150. One or more RAM memories 1180 may act as a cache memory for computer 1150.
- 10 Accessibly coupled 1162 memory 1160 may contain non-volatile memory 1190 coupled 1192 to computer 1150. Accessibly coupled memory 1160 may include more than one non-volatile memory 1190. Distinct non-volatile memories 1190 may be distinctly coupled to computer 1150. A non-volatile memory may be organized as file management system.
- 15 Note that the coupling 1182 of RAM memory 1180 may be distinct from coupling 1192 of non-volatile memory 1190 with computer 1150. Either RAM memory and/or non-volatile memory components may be packaged with computer 1150.

- Figure 21 depicts a remote control unit 1000-180 coupled 1002-180 to set-top apparatus 1100-180. Set-top appliance 1100-180 communicates via a one- or
- 20 two-stage wireline communications system containing a wireline physical transport 1200 to an augmented distributor node 1310. The communications traverse augmented distributor node 1310 interfaced to a wireline communications loop including an augmented Headend 1410. The network

may further support a communications loop including augmented metropolitan Headend **1410**.

As used herein, the adjective augmented is used to refer to a node incorporating at least one embodiment of the invention.

- 5 Augmented node **1310** may control and support optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled "Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems" by Calderone and Foster, both inventors of this application and commonly assigned to AgileTV, and incorporated herein
10 by reference.

Augmented node **1310** may provide cached content such as popular videos for a VOD service.

Speech processing may be performed in many situations at augmented node **1310**.

- 15 Augmented Headend **1410** and augmented metropolitan Headend **1410** provide speech processing capabilities. Augmented Headend **1410** may be used to handle speech processing for nodes **120** and **124**. Augmented metropolitan Headend **1410** may be used to handle speech processing for Headends **100** and **106**. Headends **100** and **106**, and nodes **120** and **124** are
20 not augmented by this invention.

Alternatively, augmented Headend **1410** may control the optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled "Increased Bandwidth in Aloha-based Frequency

Hopping Transmission Systems". Node **1310** may support the optimized upstream communication. Upstream communication from augmented node **1310** and from augmented Headend **1410** may employ the same upstream communications protocol, or different upstream communications protocol.

- 5 Note that metropolitan Headend **1410** may not be involved in the optimized upstream communication scheme.

Alternatively, metropolitan Headend **1410** may be involved in the optimized upstream communication scheme. Augmented metropolitan Headend **1410** may further control the optimized upstream communication as disclosed in the
10 co-pending application serial number 09/679,115, entitled "Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems". Augmented Headend **1410** may support the optimized upstream communication between node **1310** and set-top apparatus **1100-180**. Node **1310** may then carry out the optimized upstream communication. Upstream
15 communication from augmented node **1310** and from augmented Headend **1410** may employ the same upstream communications protocol, or different upstream communication protocols.

Note that in certain network installations, there may be no metropolitan Headend, augmented or otherwise. Further, in certain network installations,
20 there may only be one Headend.

Figure **22** depicts a remote control unit **1000-180** coupled **1002-180** to set-top apparatus **1100-180**, communicating via a two-stage wireline communications system containing a wireline physical transport **1200** to a distributor node **126**. Distributor node **126** interfaces to a wireline communications loop including an

augmented Headend **1414**. The network may further support a communications loop including augmented metropolitan Headend **1410**, in accordance with the invention.

5 Augmented Headend **1414** may control and support optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled "Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems" by Calderone and Foster, both inventors of this application and commonly assigned to AgileTV, incorporated herein by
10 reference.

Augmented Headend **1414** may provide cached content such as popular videos for a VOD service. Speech processing may be performed in many situations at augmented Headend **1414**

Augmented metropolitan Headend **1410** may further provide speech
15 processing capabilities. Augmented metropolitan Headend **1410** may be used to handle speech processing requirements for Headends **100** and **106**, which are not augmented by this invention.

The couplings between STB **1100-180**, Node **126** and Headend **1410** may also support bi-directional communication allowing the STB **1100-180** to
20 receive multiple television channels and allowing STB **1100-180** to signal at least limited information to augmented Headend **1410**, which may well include management of Pay-per-View and other services.

Alternatively, augmented metropolitan Headend **1410** may control the optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems. Augmented Headend **1414** may then support the optimized upstream communication. Upstream communication from augmented node **126** and from augmented Headend **1410** may employ the same upstream communications protocol, or a different upstream communications protocol.

Note that metropolitan Headend **1410** may not be involved in the optimized upstream communication scheme.

Alternatively, metropolitan Headend **1410** may be involved in the optimized upstream communication scheme. Augmented metropolitan Headend **1410** may further control the optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems. Augmented Headend **1410** may support the optimized upstream communication between node **126** and set-top apparatus **1100-180**. Node **126** may then carry out the optimized upstream communication. Upstream communication from node **126** and from augmented Headend **1410** may employ the same upstream communications protocol, or different upstream communication protocols.

Note that in certain network installations, there may be no metropolitan Headend, augmented or otherwise. Further, in certain network installations, there may only be one Headend.

Figure 23 depicts a detail block diagram of an augmented distributor node 1310, coupled to wireline physical transport 1200 and coupled to the wireline communications loop of Figure 21.

Note that there may be one transport 1200. Transceiver 1320 couples to transport 1200 to provide uplink 1204 and downlink 1202 communications between STB's 1100 of Figure 21.

There may be multiple transports 1200 corresponding to wireline circuits servicing combinations of at least one of the interfaces 170, 174 and 178, as shown in Figures 1, 2, 21 and 22. Transceiver 1320 couples to transport 1200 to provide uplink 1204 and downlink 1202 communications between STB's 1100 of Figures 21 and 22. Note that transceiver 1320 may provide multiple uplinks 1204. Transceiver 1320 may provide multiple downlinks 1202.

Transceiver 1320 may include transmitter 1324 providing downlink 1202 communications to wireline physical transport 1200. Multiple downlinks 1202 may be provided by transmitter 1324. Alternatively, multiple downlinks 1202 may be provided by more than one transmitter 1324.

Transceiver 1320 may include receiver 1322 providing uplink 1204 communications from wireline physical transport 1200. Multiple uplinks 1204 may be provided by receiver 1322. Alternatively, multiple uplinks 1204 may be provided by more than one receiver 1322.

Wireline physical transport 1200 may further include separate uplink physical transport 1204 and downlink physical transport 1202. Various embodiments of the invention may include multiple uplink physical transports 1204. Various embodiments of the invention may include multiple downlink physical

transports **1202**. There may be a difference in the number of uplink physical transports **1204** and the number of downlink physical transports **1202**.

Note that there may be a difference in the number of transmitters **1324** and the number of receivers **1322**.

5 By way of example, referring to Figure **21**, one downlink stream **1202** may be sent to interface **170**, and a second downlink stream, not shown in Figure **21** or Figure **23**, may be sent to interface **174**. One uplink stream **1204** may be received from interface **170**, and a second uplink stream, not shown in Figure **21** or Figure **23**, may be received from interface **174**.

10 Hereafter, the discussion focuses on a single transmitter **1324** providing as many downlinks **1202** and on a single receiver **1322** providing as many uplinks **1204** as required. This is done strictly to simplify the discussion and is not meant to imply any limitation on the invention.

Uplink **1204** communication includes a back channel. This back channel
15 includes multiple identified speech channels from multiple user sites (STBs) **1100**, as shown in Figures **21** and **22**. Receiver **1322** provides **1326** a back channel to speech engine **1330**. Speech engine **1330** performs at least the operations of Figure **10**.

Speech engine **1330** further communicatively interacts **1374** with network
20 interface **1370**. Network interface **1370** couples **1372** to other network components. Network coupling **1372** may further include a predominantly input coupling **1306** and a predominantly output coupling **1308**.

Network interface **1370** may communicatively interact **1376** with local system management and billing **1380**. Local system management and billing **1380** may include systems management and billing data relevant to the elements of the overall network managed or controlled through the local node.

- 5 Local system management and billing **1380** may further maintain systems management and billing data relevant to the elements of the overall network managed or controlled through the local node.

Local system management and billing **1380** may include a cache of systems management and billing data relevant to the elements of the overall network
10 managed or controlled through the local node.

Receiver **1322** provides **1326** a back channel to speech engine **1330**. Speech engine **1330** performs at least the operations of Figure 10. Speech engine **1330** further communicatively interacts **1374** with network interface **1370**.

- 15 Speech engine **1330** may communicatively interact **1382** with system management and billing **1380**. Speech engine **1330** may send **1382** system management and billing **1380** requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits, and parental safeguards. Speech engine **1330**
20 may send **1382** system management and billing **1380** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech engine **1330** may receive **1382** from system management and billing **1380** credit information, authorization profiles for channel viewing, credit limits

and parental safeguards. Speech engine **1330** may receive **1382** from system management and billing **1380** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions
5 with network interface **1370** or other external communications networks **1312**.

System management and billing **1380** may further include interfaces to other external communications networks. Such circuitry is not the subject of this invention and is not discussed further herein.

Similarly, the mechanism of contract acceptance between system
10 management and billing **1380** and financial engines is not the subject of this invention and is not discussed further herein.

Speech engine **1330** may receive **1338** from content engine **1340** content status information. Content status information may include a list of available services through the coupled network(s). Content status information may
15 further include a list of services available within the node.

Content status information may include a list of content items cached through the network. Content status information may further include a list of content items cached at the node. Cached content items may include Interactive Program Guide (IPG) listings for some period of time. Cached content items
20 may include one or more video sequences provided through Video On Demand (VOD) or Pay-Per-View services.

Content engine **1340** communicatively interacts **1378** with network interface **1370**. Content engine **1340** may provide at least one locally generated multimedia stream **1342** to Multiplexor engine **1360** as well as at least one multi-

media stream **1344** received **1378** through network interface **1370**. Content engine **1340** may modify multi-media stream **1344** received **1378** from network interface **1370** through network input **1306**. Content engine **1340** may stimulate **1378** network interface **1370**, altering network output **1308** from network interface **1370**.

Content engine **1340** may have more than one registered application server each presenting static menu content and dynamic content. A speech processor within speech engine **1330** may be presented a grammar based upon the static and dynamic content of multiple registered application servers.

The merged services may be presented to the users as specialized, multi-application service menus provided by the speech engine **1330** to the users.

Speech engine **1330** may generate one or more channels of speech response content through coupling **1332** to modulator engine **1350**. Modulator engine **1350** may further provide **1334** status and reliability information to speech engine **1330**. Speech response content channels presented through coupling **1332** may be digital. Speech response content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1332** by speech engine **1330**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing. Modulator engine **1350** may demultiplex multiple multiplexed channels received through coupling **1332**. Modulator engine **1250** may convert one or more demultiplexed channels into modulated channels, or modulated collections of channels, presented **1352** and **1354** to multiplexor engine **1360**.

Multiplexor engine **1360** accepts the multiple locally generated channels **1352**, **1354** and **1342** as well as the locally received, and possibly modified, external stream **1344** to create at least one merged stream **1362**. Multiplexor engine **1360** may create more than one merged stream, e.g. **1364**.

- 5 Transmitter **1324** receives at least one merged stream **1362** from multiplexor engine **1360** to generate at least one downlink stream **1202** of physical transport **1200**. Transmitter **1324** may receive more than one merged stream **1364** from multiplexor engine **1360**.

Speech engine **1330** may further interact **1312** with an external network.

- 10 Such an interaction may involve at least one wireline physical transport layer. The wireline physical layer may support at least one or a combination of communication protocols using optical, infra-red and radio frequency regions of the electromagnetic spectrum. Network interactions **1312** may support message passing protocols, including, but not limited to, TCP-IP. Network
15 interactions **1312** may further support communications with the Internet and World Wide Web.

Figure **24** depicts an alternative detail block diagram of an augmented distributor node **1310**, coupled to wireline physical transport **1200** and coupled to the wireline communications loop of Figure **21**.

- 20 Receiver **1322** provides a back channel to speech engine **1330** through interactions **1328** with switch **1390** delivering **1392** the back channel to speech engine **1330**.

Speech engine **1330** communicatively interacts **1374** with network interface **1370** by the speech engine **1330** interacting **1392** with switch **1390** which interacts **1398** with network interface **1370**.

Network interface **1370** may communicatively interact with local system management and billing **1380** by communicatively interacting **1398** with switch **1390**, which communicatively interacts **1396** with system management and billing **1380**.

Speech engine **1330** may communicatively interact **1382** with system management and billing **1380** by communicatively interacting **1392** with switch **1390**, which communicatively interacts with system management and billing **1380**.

Speech engine **1330** may receive content status information from content engine **1340** by content engine **1340** interacting **1394** with switch **1390**, which delivers **1392** the content status information to speech engine **1330**.

Content engine **1340** communicatively interacts with network interface **1370** by content engine **1340** communicatively interacting with switch **1390** and network interface **1370** communicatively interacting with switch **1390**.

Switch **1390** may support digital interfaces. Switch **1390** may include a circuit switch. The circuit switch may support Ethernet protocols. Switch **1390** may include an ATM switch. Switch **1390** may support analog interfaces. Such analog interfaces may include wavelength division multiplexing. Switch **1390** may be composed of more than one switch.

The invention may include various combinations of direct interconnections and switch networks as shown in Figures 23 and 24.

Figure 25 depicts a generic block diagram of a prior art Headend 104 as shown in Figure 3.

5 Uplink 138 communication includes a back channel.

This back channel includes multiple response channels from multiple user sites STBs, as shown in Figures 1 and 2. Receiver 1422 provides 1427 a back channel to content engine 1440.

10 Network interface 1470 may communicatively interacts 1476 with Headend system management and billing 1480. Headend system management and billing 1480 may include systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend.

Headend system management and billing 1480 may further maintain systems management and billing data relevant to the elements of the overall network
15 managed or controlled through the Headend.

Headend system management and billing 1480 may include a cache of systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend.

20 System management and billing 1480 may further include interfaces to other external communications networks. Such circuitry is not the subject of this invention and is not discussed further herein.

Content status information may include a list of content items cached through the network. Content status information may further include a list of content items cached at the node. Cached content items may include Interactive Program Guide (IPG) listings for some period of time. Cached content items
5 may include one or more video sequences provided through Video On Demand (VOD) or Pay-Per-View services.

Content engine **1440** communicatively interacts **1478** with network interface **1470**. Content engine **1440** may provide at least one locally generated multi-media stream **1442** to Multiplexor engine **1460** as well as at least one multi-
10 media stream **1444** received **1478** through network interface **1470**. Content engine **1440** may modify multi-media stream **1444** received **1478** from network interface **1470** through network input **1406**. Content engine **1440** may stimulate **1478** network interface **1470**, altering network output **1408** from network interface **1470**.

Content engine **1340** may include, but is not limited to, one or more standard components of a head-end, OTA Receivers: Over The Air Receivers and Satellite receivers and Set-Top Box Controller. A Set-Top Box Controller is the transmission equivalent of the Headend receiver. This box sends commands from the head-end to the individual user's set-top box. Those
15 commands may include change channel, set decryption key to the following, enable the set-top box to present a pay channel.
20

Multiplexor engine **1460** accepts the multiple locally generated channels **1452**, **1454** and **1442** as well as the locally received, and possibly modified, external stream **1444** to create at least one merged stream **1462**. Multiplexor
25 engine **1460** may create more than one merged stream, e.g. **1464**.

Transmitter **1424** receives at least one merged stream **1462** from multiplexor engine **1460** to generate at least one downlink stream **132** of physical transport **1200**. Transmitter **1424** may receive more than one merged stream **1464** from multiplexor engine **1460**.

5 Figure **26** depicts an augmented Headend **1410** of Figure **21** or an augmented Headend **1414** of Figure **22** or an augmented metropolitan Headend **1410** of Figures **21** or **22**, in accordance with the invention.

Note that there may be one transport **1200**. Transceiver **1420** couples to transport **1200** to provide uplink **1204** and downlink **1202** communications
10 between STB's **1100** of Figure **21**.

There may be multiple transports **1200** corresponding to wireline circuits servicing combinations of at least one of the interfaces **170**, **174** and **178**, as shown in Figures **1**, **2**, **21** and **22**. Transceiver **1420** couples to transport **1200** to provide uplink **1204** and downlink **1202** communications between STB's
15 **1100** of Figures **21** and **22**. Note that transceiver **1420** may provide multiple uplinks **1204**. Transceiver **1420** may provide multiple downlinks **1202**.

Transceiver **1420** may include transmitter **1424** providing downlink **1202** communications to wireline physical transport **1200**. Multiple downlinks **1202** may be provided by transmitter **1424**. Alternatively, multiple downlinks **1202**
20 may be provided by more than one transmitter **1424**.

Transceiver **1420** may include receiver **1422** providing uplink **1204** communications from wireline physical transport **1200**. Multiple uplinks **1204** may be provided by receiver **1422**. Alternatively, multiple uplinks **1204** may be provided by more than one receiver **1422**.

Wireline physical transport **1200** may further include separate uplink physical transport **1204** and downlink physical transport **1202**. Various embodiments of the invention may include multiple uplink physical transports **1204**. Various embodiments of the invention may include multiple downlink physical transports **1202**. There may be a difference in the number of uplink physical transports **1204** and the number of downlink physical transports **1202**.

Note that there may be a difference in the number of transmitters **1424** and the number of receivers **1422**.

As earlier, the discussion focuses on a single transmitter **1424** providing as many downlinks **1202** and on a single receiver **1422** providing as many uplinks **1204** as required. This is done strictly to simplify the discussion and is not meant to imply any limitation on the invention.

Uplink **1204** communication includes a back channel. This back channel includes multiple identified speech channels from multiple user sites (STBs) **1100**, as shown in Figures **21** and **22**. Receiver **1422** provides **1426** a back channel to speech engine **1430**. Speech engine **1430** performs at least the operations of Figure **10**.

Speech engine **1430** further communicatively interacts **1474** with network interface **1470**. Network interface **1470** couples **1472** to other network components. Network coupling **1472** may further include a predominantly input coupling **1406** and a predominantly output coupling **1408**.

Network interface **1470** may communicatively interact **1476** with Headend system management and billing **1480**. Headend system management and billing **1480** may include systems management and billing data relevant to the

elements of the overall network managed or controlled through the Headend node.

Headend system management and billing **1480** may further maintain systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend node.

Headend system management and billing **1480** may include a cache of systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend node.

Speech engine **1430** may communicatively interact **1482** with system management and billing **1480**. Speech engine **1430** may send **1482** system management and billing **1480** requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech engine **1430** may send **1482** system management and billing **1480** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech engine **1430** may receive **1482** from system management and billing **1480** credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech engine **1430** may receive **1482** from system management and billing **1480** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions with network interface **1470**, or other external communications networks.

System management and billing **1480** may further include interfaces to other external communications networks. Such circuitry is not the subject of this invention and is not discussed further herein.

Similarly, the mechanism of contract acceptance between system management and billing **1480** and financial engines is not the subject of this invention and is not discussed further herein.

Speech engine **1430** may receive **1438** from content engine **1440** content status information. Content status information may include a list of available services through the coupled network(s). Content status information may further include a list of services available within the node.

Content status information may include a list of content items cached through the network. Content status information may further include a list of content items cached at the node. Cached content items may include Interactive Program Guide (IPG) listings for some period of time. Cached content items may include one or more video sequences provided through Video On Demand (VOD) or Pay-Per-View services.

Content engine **1440** communicatively interacts **1478** with network interface **1470**. Content engine **1440** may provide at least one locally generated multi-media stream **1442** to Multiplexor engine **1460** as well as at least one multi-media stream **1444** received **1478** through network interface **1470**. Content engine **1440** may modify multi-media stream **1444** received **1478** from network interface **1470** through network input **1406**. Content engine **1440** may stimulate **1478** network interface **1470**, altering network output **1408** from network interface **1470**.

Speech engine **1430** may generate one or more channels of speech response content through coupling **1432** to modulator engine **1450**. Modulator engine **1450** may further provide **1434** status and reliability information to speech engine **1430**. Speech response content channels presented through coupling **1432** may be digital. Speech response content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1432** by speech engine **1430**. The multiplexing mechanism onto channel **1432** may perform time division multiplexing. Modulator engine **1450** may demultiplex multiple multiplexed channels received through coupling **1432**. Modulator engine **1250** may convert one or more channels into modulated channels or modulated collections of channels then presented **1452** and **1454** to multiplexor engine **1460**.

Multiplexor engine **1460** accepts the multiple locally generated channels **1452**, **1454** and **1442** as well as the locally received, and possibly modified, external stream **1444** to create at least one merged stream **1462**. Multiplexor engine **1460** may create more than one merged stream, e.g. **1464**.

Transmitter **1424** receives at least one merged stream **1462** from multiplexor engine **1460** to generate at least one downlink stream **1202** of physical transport **1200**. Transmitter **1424** may receive more than one merged stream **1464** from multiplexor engine **1460**.

Figure **27** depicts an alternative augmented Headend **1410** of Figure **21** or an alternative augmented Headend **1414** of Figure **22** or an alternative

augmented metropolitan Headend **1410** of Figures **21** or **22**, in accordance with the invention.

Receiver **1422** provides a back channel to speech engine **1430** through interactions **1428** with switch **1490** delivering **1492** the back channel to
5 speech engine **1430**.

Speech engine **1430** communicatively interacts **1474** with network interface **1470** by the speech engine **1430** interacting **1492** with switch **1490** which interacts **1498** with network interface **1470**.

Network interface **1470** may communicatively interact with Headend system
10 management and billing **1480** by communicatively interacting **1498** with switch **1490**, which communicatively interacts **1496** with system management and billing **1480**.

Speech engine **1430** may communicatively interact **1482** with system management and billing **1480** by communicatively interacting **1492** with
15 switch **1490**, which communicatively interacts with system management and billing **1480**.

Speech engine **1430** may receive content status information from content engine **1440** by content engine **1440** interacting **1494** with switch **1490**, which delivers **1492** the content status information to speech engine **1430**.

20 Content engine **1440** communicatively interacts with network interface **1470** by content engine **1440** communicatively interacting with switch **1490** and network interface **1470** communicatively interacting with switch **1490**.

Switch **1490** may support digital interfaces. Switch **1490** may include a circuit switch. The circuit switch may support Ethernet protocols. Switch **1490** may include an ATM switch. Switch **1490** may support analog interfaces. Such analog interfaces may include wavelength division multiplexing. Switch **1490** may be composed of more than one switch.

The invention may include various combinations of direct interconnections and switch networks as shown in Figures **23** and **24**.

Note that a single computer may perform the operations of the speech engine as shown in Figure **10**. The computer performs these operations as controlled by a program system including program steps residing in accessibly coupled memory.

Figure **28A** depicts a block diagram of a speech engine **1330** as shown in Figure **23**.

Receiver **1322** provides **1326** a back channel to speech processor computer **1520**. Speech processor computer **1520** further communicatively interacts **1374** with network interface **1370**.

Speech processor computer **1520** may communicatively interact **1382** with system management and billing **1380**. Speech processor computer **1520** may send **1382** system management and billing **1380** requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech processor computer **1520** may send **1382** system management and billing **1380** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech processor computer **1520** may receive **1382** from system management and billing **1380** credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech processor computer **1520** may receive **1382** from system management and billing **1380** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions with network interface **1370** or other external communications networks **1312**.

Speech processor computer **1520** may receive **1338** from content engine **1340** content status information. Content status information may include a list of available services through the coupled network(s). Content status information may further include a list of services available within the node.

Speech processor computer **1520** may generate one or more channels of speech response content through coupling **1332** to modulator engine **1350**.

Modulator engine **1350** may further provide **1334** status and reliability information to speech processor computer **1520**. Speech response content channels presented through coupling **1332** may be digital. Speech response content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1332** by speech processor computer **1520**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing. Modulator engine **1350** may demultiplex multiple multiplexed channels received through coupling **1332**. Modulator engine **1250** may convert one or more demultiplexed channels into

modulated channels or modulated collections of channels then presented
1352 and 1354 to multiplexor engine 1360.

Speech processor computer 1520 may further interact 1312 with an external
network. Such an interaction may involve at least one wireline physical
5 transport layer. The wireline physical layer may support at least one or a
combination of communication protocols using optical, infra-red and radio
frequency regions of the electromagnetic spectrum. Network interactions
1312 may support message passing protocols, including, but not limited to,
TCP-IP. Network interactions 1312 may further support communications with
10 the Internet and World Wide Web.

Speech processor computer 1520 communicatively couples with mass
storage 1540. Mass storage 1540 may include, but is not limited to, a disk,
disk farm, or RAID. Mass storage 1540 may be organized by a file
management system, or by one or more database management systems, or
15 by a combination of file management and at least one database management
system.

Figure 28B depicts a block diagram of a speech engine 1330 as shown in
Figure 24.

Receiver 1322 provides a back channel to speech processor computer 1520
20 through interactions 1328 with switch 1390 delivering 1392 the back channel
to speech engine 1520.

Speech processor computer 1520 communicatively interacts 1374 with
network interface 1370 by the speech processor computer 1520 interacting
1392 with switch 1390 which interacts 1398 with network interface 1370.

Speech processor computer **1520** may communicatively interact **1382** with system management and billing **1380** by communicatively interacting **1392** with switch **1390**, which communicatively interacts with system management and billing **1380**.

- 5 Speech processor computer **1520** may receive content status information from content engine **1340** by content engine **1340** interacting **1394** with switch **1390**, which delivers **1392** the content status information to speech processor computer **1520**.

As in Figure **24**, switch **1390** may support digital interfaces. Switch **1390** may
10 include a circuit switch. The circuit switch may support Ethernet protocols. Switch **1390** may include an ATM switch. Switch **1390** may support analog interfaces. Such analog interfaces may include wavelength division multiplexing. Switch **1390** may be composed of more than one switch.

The operational discussions found in Figures **3**, **4**, **5** and **28A** are directly
15 applicable to systems implementing the invention and resembling the block diagram of Figure **28B**. They will not be presented regarding Figure **28B**. This is done simply to clarify the disclosure and is not intended in any way to limit the scope of the claims.

The invention may include various combinations of direct interconnections
20 and switch networks as shown in Figures **23** and **24**.

Figure **29** depicts a more detailed block diagram of a speech engine **1330** containing gateway **3100** and tightly coupled server array **3200** as shown in Figure **28A**.

Server array **3200** includes at least speech processor computer **1520** communicatively coupled with at least speech gateway **3100**.

Receiver **1322** provides **1326** a back channel to speech processor computer **1520** via speech gateway **3100**. Speech gateway **3100** may further cache
5 speech utterances from various user sites for speech processor computer **1520**.

Speech processor computer **1520** further communicatively interact **1374** with network interface **1370** via speech network gateway **1582**.

Speech processor computer **1520** may communicatively interact **1382** with
10 system management and billing **1380** via secure interface **1578**. Speech processor computer **1520** may send **1382** via secure interface **1578** requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech processor computer **1520** may send **1382** via secure
15 interface **1578** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech processor computer **1520** may receive **1382** via secure interface **1578** credit information, authorization profiles for channel viewing, credit limits
20 and parental safeguards. Speech processor computer **1520** may receive **1382** via secure interface **1578** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions with network interface **1370** or other external communications networks **1312**.

Speech processor computer **1520** may receive **1338** from content engine **1340** content status information. Content status information may include a list of available services through the coupled network(s). Content status information may further include a list of services available within the node.

5 Speech processor computer **1520** may generate one or more channels of speech response content through coupling **1332** to modulator engine **1350**. Modulator engine **1350** may further provide **1334** status and reliability information to speech processor computer **1520**. Speech response content channels presented through coupling **1332** may be digital. Speech response
10 content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1332** by speech processor computer **1520**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing.

15 Speech processor computer **1520** may further interact **1312** with an external network. Such an interaction may involve at least one wireline physical transport layer, each using at least one of optical, infra-red and radio frequency regions of the electromagnetic spectrum. Network interactions **1312** may support message passing protocols, including, but not limited to,
20 TCP-IP and may further support communications with the Internet and World Wide Web.

Figure **30** depicts an alternative detailed block diagram of a speech engine **1330** as shown in Figure **28A**.

Speech engine **1330** includes server array **3200**. Server array **3200** includes at least speech processor computer **1580** and speech processor computer **1590**. At least one of speech processor computer **1580** and speech processor computer **1590** communicatively couples with speech gateway **3100**.

- 5 Receiver **1322** provides **1326** a back channel to server array **3200** via speech content gateway **3100**. Speech content gateway **3100** may further cache speech utterances from various user sites for server array **3200**.

Speech content gateway **3100** may further include a computer accessibly coupled **3102** with memory **3104**. Speech content gateway **3100** may be
10 controlled by a program system containing program steps residing in memory **3104** for at least one of the operations of Figure 10.

Speech processor computer **1580** and/or **1590** may communicatively interact **1382** with system management and billing **1380** via secure interface **1578**. Speech processor computer **1580** and/or **1590** may send **1382** via secure
15 interface **1578** requests for user account information, including, but not limited to, requests for credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech processor computer **1580** and/or **1590** may send **1382** via secure interface **1578** user passwords, confirmation of commitments, commands regarding authorization levels of
20 other users, such as children within a user's household.

Speech processor computer **1580** and/or **1590** within server array **3200** may receive **1382** via secure interface **1578** credit information, authorization profiles for channel viewing, credit limits, parental safeguards as well as confirmation of acceptance of contracts from financial engines.

Acceptance of contracts from external financial engines may be received in a number of different ways, including speech processor computer **1580** and/or **1590** interacting through network gateway **1560** with network interface **1374** and/or other external communications networks **1312**.

- 5 Either speech processor computer **1580** or **1590** within server array **3200** may receive **1338** from content engine **1340** content status information.

10 Either speech processor computer **1580** or **1590** within server array **3200** may generate one or more channels of speech response content through modulator interface **1570** coupling **1332** to modulator engine **1350**. Modulator engine **1350** may provide **1334** status and reliability information through modulator interface **1570** to at least one of speech processor computer **1580** and **1590** within server array **3200**. Speech response content channels presented through modulator interface **1570** to coupling **1332** may be digital, presented as bits or clusters of bits of a specific bit width.

- 15 Multiple channels may be multiplexed through modulator interface **1570** onto coupling **1332** by server array **3200**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing. The multiplexing mechanism may be performed by modulator interface **1570**.

20 At least one speech processor computer **1580** and **1590** within server array **3200** may communicatively interact **1374** with network interface **1370** via network gateway **1560**.

At least one speech processor computer **1580** and **1590** within server array **3200** may interact **1312** with an external network involving at least one wireline physical transport layer. The wireline physical layer may support one

or a combination of communication protocols using optical, infra-red and radio frequency regions of the electromagnetic spectrum. Network interactions **1312** may support message passing protocols, including but not limited to, TCP-IP, possibly including communications with the Internet and World Wide Web.

Speech processor computer **1580** and/or **1590** communicatively couples with mass storage **1540**. Mass storage **1540** may include, but is not limited to, a disk, disk farm, or RAID organized by a file management system and/or by one or more database management systems.

Speech processor computer **1580** and/or Speech processor computer **1590** may perform at least some of the operations of Figure **10** and be directed by program system **2000** containing program steps residing in memory **1586** and/or **1596** accessibly coupled **1585** and/or **1595** to the respective speech processor computer.

Speech processor computer **1580** may perform the same operations of Figure **10** as speech processor computer **1590**, possibly processing speech from different user sites.

Speech processor computer **1580** may perform different operations of Figure **10** than speech processor computer **1590**. By way of example, speech processor computer **1580** may perform receiving the back channel **2004** and partitioning the back channel into the multiple received identified voice channels **2012**. Speech processor computer **1590** may perform processing the multiple received identified voice channels to create multiple identified

speech contents **2022** and responding to the multiple identified speech contents **2032**.

Speech engine **1330** may be controlled by a program system **2000** implementing the operations of Figure **10** distributed as program steps residing in at least one of the memories **3104**, **1586** and **1596**. Each of the operations **2004**, **2012**, **2022**, and **2032** may be implemented as program steps residing in memories **3104**, **1586** and **1596**.

By way of example, speech content gateway **3100** receives the back channel **2004**. Speech processor computer **1580** partitions the back channel into the multiple received identified voice channels **2012**. Speech processor computer **1590** processes the multiple received identified voice channels to create multiple identified speech contents **2022** and responds to the multiple identified speech contents **2032**.

By way of an alternative example, speech content gateway **3100** receives the back channel **2004** and partitions the back channel into the multiple received identified voice channels **2012**. Speech processor computers **1580** and **1590** each process the multiple received identified voice channels to create multiple identified speech contents **2022** and respond to the multiple identified speech contents **2032**. Speech processor computers **1580** and **1590** perform these operations upon different identified voice channels based upon allocation decisions performed by speech content gateway **3100**. To process a speech sample by the allocated speech processor computer into speech content, the processor computer must first contain in its local memory a copy of the grammar definition associated with the user site.

Figure **31** depicts a second alternative detailed block diagram of a speech engine **1430**.

Server array **3200** at least includes speech processor computer networks **1640** and **1650**. At least one computer contained in speech processor computer network **1640** and/or **1650** communicatively couples with speech gateway **3100**.

At least one computer contained in speech processor computer network **1640** and/or **1650** performs at least some of the operations of Figure **10** and may be directed by program system **2000** containing program steps residing in memory accessibly coupled to that computer.

Speech processor computer network **1640** may perform different operations of Figure **10** than speech processor computer network **1650**. By way of example, speech processor computer network **1640** processes the multiple received identified voice channels to create multiple identified speech contents **2022**. Speech processor computer network **1650** responds to the multiple identified speech contents **2032**.

Speech engine **1430** may be controlled by a program system implementing Figure **10**, distributed as program steps residing in memories accessibly coupled to at least one computer in one or more of the following: speech content gateway **3100**, speech processor computer network **1640** and/or speech processor computer network **1650**. Each of the operations **2004**, **2012**, **2022**, and **2032** may be implemented as program steps residing in at least one of these memories.

By way of example, one or more computers in the speech content gateway **3100** receive the back channel **2004** and partition the back channel into the multiple received identified voice channels **2012**. Computers in speech processor computer networks **1640** and/or **1650** process the multiple received identified voice channels to create multiple identified speech contents **2022** and respond to the multiple identified speech contents **2032**. Computers in the speech processor computer networks perform these operations upon identified voice channels based upon allocation decisions performed by speech content gateway **3100**.

At least one computer in speech processor computer network **1640** and/or **1650** communicatively interacts **1482** with system management and billing **1480** via secure interface **1630**. That computer(s) may send **1382** via secure interface **1630** requests for user account information as well as commands regarding authorization levels of other users, such as children within a user's household. The user account information may include, but is not limited to, credit information, authorization profiles for channel viewing, credit limits, parental safeguards, user passwords, and confirmation of commitments. A computer in speech processor computer network **1640** and/or **1650** may receive **1482** via secure interface **1630** credit information, authorization profiles for channel viewing, credit limits, parental safeguards, as well as confirmation of acceptance of contracts from financial engines.

Acceptance of contracts from external financial engines may be received in a number of different ways, including through at least one computer in speech processor computer network **1640** and/or **1650** interacting through network

gateway **1560** with network interface **1474** or with other external communications networks **1412**.

At least one computer in speech processor computer network **1640** and/or **1650** may receive **1438** from content engine **1440** content status information.

- 5 At least one computer in speech processor computer network **1640** and/or **1650** generates one or more channels of speech response content through modulator interface **1620** coupling **1432** to modulator engine **1450**. Modulator engine **1450** may provide **1434** status and reliability information through modulator interface **1620** to at least one computer in speech processor
10 computer network **1640** and/or **1650**.

At least one computer in speech processor computer network **1640** and/or **1650** communicatively interact **1474** with network interface **1470** via network gateway **1610**. At least one computer in speech processor computer network **1640** and/or **1650** may interact **1412** with an external network.

- 15 Note that AgileTV™ Voice Processing Unit (AVPU) boxes **3000** may be included in speech engine **1430** and/or in speech processor computer network **1640** and/or **1650**.

Figure **32A** depicts a block diagram of modulator engine **1350** of Figures **23** and **24**, and modulator engine **1450** of Figures **26** and **27**.

- 20 Speech engine **1330** or **1450** generates one or more channels of speech response content through coupling **1332** or **1432** to modulator engine **1350** or **1450**, respectively. For the sake of simplifying the discussion, from the discussion of Figure **32A** focuses on its application in Figures **23** and **24**. This

is done strictly to clarify the discussion and is not meant to limit the scope of the claims.

Modulator engine **1350** may provide **1334** status and reliability information to speech engine **1330**. Speech response content channels presented through coupling **1332** may be digital, presented as bits or clusters of bits.

Multiple channels are multiplexed onto coupling **1332** by speech engine **1330**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing. Modulator engine **1350** demultiplexes the multiple multiplexed channels received through coupling **1332**, converting one or more demultiplexed channels into modulated channels or modulated collections of channels presented **1352** and **1354** to multiplexor engine **1360**.

Note that the invention may target specific layers of a residential broadband network serving at least cable television needs for a user community. Modulator engine **1350** may satisfy specific requirements for a wireline node serving a Hybrid Fiber/Coaxial HFCOax node. Modulator engine **1450** may satisfy specific requirements for a wireline node serving a Headend or serving a metropolitan Headend.

Modulator engine **1350** may include modulator input and control circuit **1700** receiving one or more channels of speech response content through coupling **1332** and possibly providing **1334** status and reliability information to speech engine **1330**.

Modulator input and control circuit **1700** may perform operations as disclosed in Application no. 09/661,486, entitled N-way Demultiplexor, docket number AGLE0008, filed 14 September, 2000, and incorporated herein by reference.

Modulator input and control circuit **1700** generates at least one channel code stream **1702** provided to modulator circuit **1706**. Modulator circuit **1706** uses the channel code stream **1702** to generate an intermediate frequency channel stream **1712** presented to frequency conversion circuit **1710**.

5 By way of example, Figure **32A** depicts modulator input and control circuit **1700** generating a second channel code stream **1704** presented to modulator circuit **1706**. Modulator circuit **1706** uses this second provided channel code stream **1704** to generate a corresponding intermediate frequency channel stream **1714** presented to frequency conversion circuit **1710**.

10 Frequency conversion circuit **1710** receives at least one intermediate frequency channel stream **1712** and generates a frequency channel output stream **1352** presented to multiplexor engine **1360**, as shown in Figures **23** and **24**. Similarly in Figures **26** and **27**, frequency conversion circuit **1710** receives at least one presented intermediate frequency channel stream **1712**
15 and generates a frequency channel output stream **1452** presented to multiplexor engine **1460**.

Frequency conversion circuit **1710** may receive a second presented intermediate frequency channel stream **1714** and generate a second frequency channel output stream **1354** presented to multiplexor engine **1360**,
20 as shown in Figures **23** and **24**. Similarly in Figures **26** and **27**, frequency conversion circuit **1710** may receive a second presented intermediate frequency channel stream **1714** and generate a second frequency channel output stream **1454** presented to multiplexor engine **1460**.

Frequency conversion circuit **1710** may provide feedback **1708** to modulator input and control **1700**, which may be part or all of the status and reliability information **1334** provided to speech engine **1330**.

Alternatively feedback **1708** may be status and reliability information **1334** directly provided to speech engine **1330**, rather than through modulator input and control **1700**. This alternative has not been diagramed to simplify the discussion, but is not intended to limit the scope of the claims.

Modulator circuit **1706** generates intermediate frequency channel stream **1712** using provided channel code stream **1702**.

Intermediate frequency channel stream **1712** may include presentation of a sinusoidal waveform represented as a digital stream, or as an analog stream. Presented channel code stream **1702** may include phase control information and/or include frequency control information include amplitude control information. The frequency control information may further regard an intermediate frequency carrier.

Control information may be presented in a separate channel stream.

The intermediate frequency channel stream generation mechanism may support coherent detection and use of the intermediate frequency carrier in a downstream user site receiver. The intermediate frequency channel stream generation mechanism may support modulation mechanisms, including at least, Phase Shift Keying (PSK), Frequency Shift Keying (FSK), Amplitude Shift Keying (ASK), Continuous Phase Modulation (CPM), hybrid combinations, Offset Quadrature PSK (OQPSK), Minimum Shift Keying (MSK), Quadrature Amplitude Modulation (QAM), Coded Orthogonal

Frequency Division Multiplexing (COFDM) and Vestigial Side Band (VSB), in particular 8 level VSB (8-VSB).

The intermediate frequency channel stream generation mechanism may support noncoherent detection in downstream user site receivers of the intermediate frequency carrier and/or detection mechanisms not requiring a carrier reference. The intermediate frequency channel stream generation mechanism may support modulation mechanisms, including at least, Differential Phase Shift Keying (DPSK), Frequency Shift Keying (FSK), Amplitude Shift Keying (ASK), and certain hybrid schemes of these mechanisms not requiring a carrier reference.

Intermediate frequency channel stream **1712** may include presentation of a wavelet function represented as a digital stream or as an analog stream, which may further include dilation control information and/or temporal offset control information and/or amplitude control information.

Intermediate frequency channel stream **1712** may include presentations of both sinusoidal and wavelet functions.

The invention may include multiple frequency conversion circuitry instances **1710** and multiple modulator circuitry instances **1706** in modulator engine **1350** with possibly different numbers of instances of frequency conversion circuitry **1710** and of modulator circuitry **1706**.

The invention may include multiple frequency conversion circuitry instances **1710** and modulator circuitry instances **1706** in modulator engine **1450** with possibly different numbers of instances of frequency conversion circuitry **1710** and of modulator circuitry **1706**.

Demultiplexing a 2.5 gigabit per second bit stream leaving the speech engine **1330** or **1430** may be performed by a preprocessor CPU creating two 16 bit streams. The preprocessor CPU may be part or all of a Broadcom BCM 12500 integrated circuit converting the Ethernet links, with approximately
5 three gigabit bits per second, into two 16 bit 150-160 MHz digital streams.

Modulator input and control **1700** may include two preprocessor CPUs parsing the dual 16 bit interface streams into 96 channels of data, or alternatively, include this function performed by hardware.

Modulator circuitry **1706** may include multiple modulators and may include
10 multiple instances of multiple channel modulators, which may implement an octal QAM (Quadrature Amplitude Modulator).

Clusters of 8 channels of data may be sent to each Octal QAM for conversion to a intermediate frequency signal presented to an associated multi-channel frequency upconverter **1710** to generate 8 discrete channels sharing the
15 same output frequency. Each channel output is supplied to one or more nodes to the exclusion of other nodes.

One system wide channel may be devoted to the audio-video feedback of the speech recognition system, of which there are 96 instances of that single channel which are then multiplexed into 96 different fiber transmission lines,
20 each with a unique speech recognition related television channel.

This is exploited much more efficiently than any known prior art. Because all these frequency up conversions target the same frequency band, the frequency conversion mechanism for multiple channels can share several

critical components, such as local reference oscillators, which must otherwise be instantiated for each channel separately.

By performing the frequency conversion mechanism upon blocks of channels, an optimization is available in neighborhoods with extensive Internet usage. In such situations, a neighborhood may be allocated a second TV channel for Internet presentation. By reconfiguring one block of frequency converters to that second channel, up to 8 neighborhoods could receive a second television channel.

Configuring these frequency conversion mechanisms as a frequency agile block changes the channel frequency bands of all the channels of the frequency agile block simultaneously.

The cost savings are dramatic. Regarding reliability issues: there are far fewer parts, a simpler design and less heat, all tending to increase reliability.

There may be a hierarchy of multiplexors operating within content engine **1340** or **1440**. System wide channels are multiplexed in the one set of multiplexors within the content engine **1340** or **1440**. Node specific channels may be multiplexed in a second set of multiplexors within the content engine **1340** or **1440**, which may be within a multiplexor engine such as **1460**.

In a cable TV system using a VOD server, 8 to 16 channels per node are often used for delivery of video on demand. These node specific channels are multiplexed in a second set of multiplexors within the content engine **1340** or **1440** and may be further multiplexed in multiplexor engine **1460**.

Each NTSC television channel has approximately 6 MHz of bandwidth, which through the use of the QAM64 modulators, delivers 27 M bps. The 2.5 Gigabit per second being delivered supports about 4500 Internet users.

Figure **32B** depicts a block diagram of a local oscillator as is known in the art for use as a local oscillator depicted in Figures **33** and **34** as LO1 **1760**, LO1 **1860**, LO2 **1770** or LO2 **1870**.

The first Local Oscillator (LO1) **1760** or **1860** may operate at a fixed frequency **1762** in the range from 900 MHz to 1100 MHz. A second Local Oscillator (LO2) **1770** or **1870** may operate **1772** in a variable range from 1 to 2 GHz, depending on the desired output frequency range.

The Local Oscillators each comprise a voltage controlled oscillator, a frequency synthesizer and a loop filter. The frequency synthesizer requires a frequency reference. The output of the voltage controlled oscillator is amplified to create local oscillator output, which in various instances is labeled **1762**, **1772**, **1862** and **1872**.

The frequency synthesizers are required to meet the demanding phase noise, frequency stability and frequency settability requirements of a modern digital cable television network. A substantial portion of the circuitry in the typical Upconverter **1710** is dedicated to the synthesizers of the local oscillators **1760**, **1770**, **1860** and **1870**.

Specific applications in cable television require a common frequency but with multiple RF outputs such as broadcasting node specific video content or data over multiple nodes using a fixed channel frequency the current practice is to rely on individual RF modulators/Upconverters **1710** per node. Using

individual modulator/Upconverters consumes a large amount of equipment rack space which, for many nodes, including most CATV headends, is a rare commodity.

Figure 33 depicts a detail block diagram of frequency conversion circuitry 1710 of Figure 32A.

A substantial portion of the circuitry in the typical Upconverter is dedicated to the synthesizers of the local oscillators 1860 and 1870.

The invention includes methods implementing a Common Carrier, Multiple Output RF Upconverter 1710, which include at least one of two methods by which to distribute Local Oscillator signals. The distribution methods provide a local oscillator signal from one local oscillator to multiple upconverter sections simultaneously, eliminating the frequency synthesizers and Voltage Controlled Oscillators typically required for each individual upconverter section. Eliminating these frequency synthesizers and local oscillators substantially reduces the board space and component count normally required for these functions.

By providing a distributed LO, only two LO synthesizers and VCO's are required per board where a board might support anywhere from 2 to 12 or more, upconverter sections.

Figure 34 depicts an alternative detail block diagram of frequency conversion circuitry 1710 of Figure 32A.

For the purposes of simplifying the discussion, the two methods of distributing local oscillator signals will be discussed as associated with the first and

second local oscillator, respectively. This is done strictly to simplify the discussion and is not meant to limit the scope of the claims. The first distribution mechanism may be used to distribute the second local oscillator signal(s). The second distribution mechanism may be used to distribute the first local oscillator signal(s).

The first mechanism **1764** distributes the local oscillator signal using hybrid splitters **1766** where the RF output of each tap **1724** and **1824** is fed to the respective frequency conversion sections.

A second mechanism **1774** distributing local oscillator signals uses a distributive signal splitting scheme comprised of a series of hybrid directional couplers equally spaced along a signal distribution path. The Local Oscillator signal from the tap of each coupler is then fed to the LO input **1744** and **1844** of each upconverter section. At the 950 to 1100 MHz LO frequencies mentioned above, a directional coupler may be implemented using circuit board traces **1776** in specific geometric pattern, eliminating the need for additional physical components.

Both methods require the LO signals from the splitters or the directional couplers undergo amplification immediately after splitting using a common Monolithic Microwave Integrated Circuit (MMIC) and/or may be incorporated into mixers **1720**, **1740**, **1820** and **1840**.

The Local Oscillator signal levels fed to the mixers are adjusted through the use of resistive attenuators to accommodate the LO drive level specified by the mixer manufacturer. For passive type mixers, the LO drive levels range from +13 dBm to +17 dBm. For active mixers such as a Gilbert Cell based

devices, the LO drive levels vary widely, according to the configuration of the mixer. Many Gilbert Cell type mixers incorporate a LO amplifier, thereby requiring very low external LO drive levels, typically in the range from -10dBm to +2dBm.

5 The Common Carrier, Multiple Output type upconverter differs from the conventional CATV upconverter in that typically, conventional Upconverters are set up to output a separate frequency for each upconverter unit. In contrast, The Common Carrier, Multiple Output Upconverter outputs the same frequency for each upconverter unit.

10 The Intermediate Frequency (IF) inputs **1712** and **1724** to the Common Carrier, Multiple Output Upconverter may be either a 44 MHz or a 43.75 MHz (Center Frequency) Intermediate Frequency. The bandwidth of the IF is typically 6 MHz for U.S. applications and 7 to 8 MHz for international applications. The 55 MHz Low Pass Filters **1716** and **1816** serve two
15 functions. First, they remove any second or third harmonics generated in the amplifier chain or D/A converter as in the case of QAM modulation in **1706**. Second, they serve as de-glitching filters for applications that use a D/A converter to generate the 44 MHz IF such as a QAM modulator **1706**.

The filtered 44 MHz IF **1718** and **1818** at the output of the 55 MHz filter **1716**
20 and **1816** is fed to the RF input of the First Mixer **1720** and **1820** where it is mixed with the first Local Oscillator **1760**. By way of example, assume the frequency of the First Local Oscillator **1760** is 903 MHz. The output **1722** and **1822** of First Mixer **1720** and **1820** contain an upper and lower sideband around this Local Oscillator frequency. These sidebands, located at 44 MHz
25 above and 44 MHz below the 903 MHz Local Oscillator frequency, are

amplified and fed to the 947 MHz bandpass filter BPF1 **1730** and **1830**. The 947 MHz bandpass filter **1730** and **1830** passes the $903 + 44$ MHz (947 MHz) upper sideband and rejects the 903-44 MHz (859 MHz) lower sideband.

The filtered output **1732** and **1832** from 947 MHz filter **1730** and **1830** is fed into the RF input of second mixer **1740** and **1840** where it is mixed with the Local Oscillator **1770**. The second Local Oscillator **1770** includes a wide bandwidth VCO controlled by a frequency synthesizer. The Second Local Oscillator **1770** may operate from 1.0 GHz to a little over 1.8 GHz with a frequency step size of 250 KHz. Output **1742** and **1842** from the second mixer **1740** and **1840** contains several frequency products, including the upper and lower sidebands.

The upper sideband is formed by adding 947 MHz to the frequency of the Second Local Oscillator **1770**. If the frequency of the Second Local Oscillator **1770** is set to 1000 MHz, then the frequency of the upper sideband coming from the Second Mixer **1750** and **1850** is $947 \text{ MHz} + \text{Frequency of the Second Local Oscillator } 1770$ (1000 MHz) or 1947 MHz.

This sideband, which is unwanted, may be filtered out by the 950 MHz Lowpass filter **1750** and **1850** and is not seen at the RF output **1452** and **1454** of the frequency conversion circuitry. The frequency of the lower sideband, which is desired, is determined by the frequency of the second LO (1000 MHz) -947 MHz producing an output frequency of 53 MHz, which easily passes through the 950 MHz Lowpass filter.

If the frequency of the Second Local Oscillator **1770** was increased to 1807 MHz, then the lower sideband from the second mixer **1740** and **1840** would

be 860 MHz, still able to pass through the 950 MHz Lowpass output filter **1750** and **1850**. The outputs **1752** and **1852** from the 950 MHz Lowpass filter **1750** and **1850** are amplified in amplifier detector **1760** and **1860** to obtain the desired output level and sent **1452** and **1454** to the output connector. The
5 amplifier detector may further include tapping off a small portion of the output power, using a directional coupler, to facilitate power measurement **1762** and **1862**.

The Common Carrier, Multiple Output method differs from the conventional upconverter in at least the following ways. In the Common Carrier system, a
10 single first Local Oscillator and second Local Oscillator drive each upconverter section in a multiple upconverter system. This is accomplished by splitting the Local Oscillator signal into as many lines as needed to drive the mixer in each section. After splitting the LO signal N times, the LO power is reduced and requires amplification to bring the level up for the respective
15 mixer. By splitting both first and second Local Oscillator signals in this manner, the number of upconverter sections for a given board size can be increased dramatically.

Splitting the Local Oscillator can also be achieved using directional couplers. To maintain essentially consistent LO power along the distribution path, the
20 directional coupler method uses couplers with varying tap values. Couplers closest to the VCO's have the highest tap values (Highest tap attenuation) and the couplers closest to the end have the lowest tap values.

The operations of the vertical chains of mixers and filters are essentially the same as described in Figure 33.

In the first frequency conversion section of upconverter **1710** of both Figures **33** and **34**, the second Local Oscillator (LO2) **1770** may comprise a wide bandwidth Voltage Controlled Oscillator, providing the frequency setting agility to span the 50 to 860 MHz frequency range mentioned above. Both Local
5 Oscillators **1760** and **1770** may require high stability frequency synthesizers to meet phase noise, frequency stability and frequency settability requirements of a modern digital cable television network, by way of example.

Consider the second frequency conversion section of Figure **34**. Received intermediate frequency channel stream **1714** may be filtered **1816** to present
10 a filtered intermediate frequency signal **1818** to Mixer1 **1820**.

Unlike Figure **33**, there is no first Local Oscillator (LO1) **1860** in the second frequency conversion section typically operates at a fixed frequency **1862** in the range from 900 MHz to 1100 MHz.

Unlike Figure **33**, there is no second Local Oscillator (LO2) **1870** operates
15 **1872** in the range from 1 to 2 GHz, depending on the desired output frequency range.

Substantial circuitry of this Upconverter section is released from supporting the local oscillators **1860** and **1870**, of Figure **33**.

Figure **35** depicts a detailed diagram of speech engine **1330** as shown in
20 Figure **23** or speech engine **1430** as shown in Figure **27** containing two plex communications grids with dual, redundant gateways.

The numbering scheme is consistent with plex.cpp, an appendix to Application No. 09/679,115, entitled "System and Method of a Multi-

dimensional Plex Communication Network”, docket number AGLE0003, filed 14 October, 2000, which is incorporated by reference herein.

ROM and mass storage is coupled to CPU 8.0, which is associated with node 0.0 of the first plex network. CPU 8.0 is reserved for certain control and security activities, such as maintaining the mass storage system and its interface, as well as initializing the rest of the plex communication grid to which it is coupled. Mass storage may include RAID mass storage systems.

Note that CPU 8.0 is coupled with both CPU1 0.0 and CPU2 0.1. This coupling may be achieved by various mechanisms, including but not limited to, a bridge circuit interface to a bus tightly coupling CPU1 and CPU2, implementing a bus standard such as LDT or PCI.

Similar couplings are shown for the following: CPU 8.1 coupled with CPU1 1.2 and CPU2 1.3. CPU 8.2 coupled with CPU1 2.4 and CPU2 2.5. CPU 8.3 coupled with CPU1 3.6 and CPU2 3.7. CPU 8.4 coupled with CPU1 4.0 and CPU2 4.1. CPU 8.5 coupled with CPU1 5.2 and CPU2 5.3. CPU 8.6 coupled with CPU1 6.4 and CPU2 6.5. CPU 8.7 coupled with CPU1 7.6 and CPU2 7.7.

ROM and mass storage are redundantly coupled to CPU 8.4, associated with the second plex network. This removes the possibility of a failure in the coupling between either the ROM or mass storage causing systemic failure in the speech engine as a whole. Software running on CPU 8.0 and CPU 8.4 may further support fail-over in the event of a failure of either CPU.

CPU 8.0 and 8.4 act as dual, redundant secure interface gateways.

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The control processors of the AgileTV™ engines may be treated differently by the message routing algorithms: No messages may be routed through the control processors, CPU 8.0 and 8.4, headed for a different destination. The CPU 8.0 and 8.4 IO lines may support internal management functions within the node of the cable network, specifically management and billing. This is advantageous for security, making it harder for hacker attacks to penetrate to the management and billing communications, since such attacks will not be able to directly communicate with CPU 8.0 and 8.4 or their IO lines.

Alternatively, special classes of communications may route through the control processor with defined protocols. Other types of communications may transit the node to which the control processor belongs, but may not terminate at the control processor. While it is common for large-scale networks to be partitioned, this partitioning approach is novel, providing very well characterized data paths for both management and billing communications.

It is advantageous that the control processor owns the disk resources, so that sensitive information such as credit card information does not go through less secure components of the plex network. Sensitive information goes directly from the disk resource through the control processor to the billing application.

Security may be heightened by use of at least one encryption standard including the AES algorithm recently proposed by the US government.

Input processors (8.1 and 8.5) perform the following: receiving incoming voice packets; buffering the received voice packets; detecting last packet of the received packet sequence to create a complete packet-sequence; and

translating the received packet sequence to create a complete audio utterance.

The content gateway includes processors 8.1 and/or 8.5. After registering the application with the AgileTV™ engine, static menu content and dynamic content are provided to the AgileTV™ engine. A speech processor within the AgileTV™ engine sends messages to an application server within the content engine through the content gateway, indicating the current user location in the menu structure and the requested user actions. This triggers events in a real-time event driven program operating system executing within the application server.

CPUs 8.1 and 8.5 may also run a job assignment manager. The job assignment manager may further behave much like a finite state machine.

The IO and control CPUs, 8.1 to 8.7, may be seen as separate from the plex array of processors, or as components of specialized plex-nodes within the plex. The invention may include placing control and IO CPUs as a row of processing resources arranged on a diagonal of the array. The array may be square. Boot ROMs, RAID interfaces, additional communication and image processing capabilities may be additionally coupled to one or more of the IO and control CPUs.

A service modem may connect to a line outside the building of a node or head-end. Each installation may have this modem as a final backup communication channel to a remote service center. CPUs 8.0 and 8.4 may also have the dual modems on a telephone line connected to a remote service center.

CPU 8.1 and 8.5 are input CPUs communicating the head-end receivers, local content servers such as VOD servers and IPG servers.

CPU 8.2 and 8.6 are Internet interface processors providing firewall capability.

- 5 CPU 8.3 and 8.7 drive the AgileTV™ modulator system **1350** or **1450** as shown in Figures **23**, **24**, **26** and **27**.

External network interfaces **1312** and **1412** may include External OC-48 (2.5 Gigabit) and/or Gigabit Ethernet Internet lines. This is a central linkage to the Internet supporting 100M bit Ethernet or other communications protocol.

- 10 AgileTV™ engine **3000**, **1330**, and **1430** may include two planes of processors, connected by tunnels, each processor plane containing a row of processors coupled by the tunnels and positioned about the diagonal of each processor plane. A diagonal as used herein refers to a collection of locations within an array of at least two dimensions which collectively contain nodes
- 15 coupled to every pencil in every orthogonal pencil ###

- Carrier class reliability of 99.999% is the baseline reliability for the plex communications networks. Simulation analyses by one of the inventors confirm that the redundancy inherent in multiple communication pencils intersecting at a plex-node provides significant fault tolerance. These
- 20 simulations, using the plex.cpp program, indicate that for up to 25 system element failures, there were no message routing failures for 42 out of 43 experiments. The independent power supplies driving dual, plex planes further support these reliability objectives, since if one power supply fails, only

half of the system fails. The other half of the system continues to perform, though performance is reduced.

A scaling methodology including another reliability mechanism is desirable. It is achieved at no appreciable increase in the usual systems overhead issues, latency, bandwidth, creating communication bottlenecks or adding significant additional computational loads to the network node components. Another IO processor is added for inter-engine plex-ing to couple multiple plex network hierarchies by the following method: Pick a plex-node, add an inter-processor communication interface internal to the plex-node and an another IO processor coupled to the inter-processor communications interface. The inter-processor communications interface may support a bus, which may be an LDT-compliant bus.

Putting two of these IO processors into the network shown in Figure 35 supports another 6 gigabit Ethernet fibers. This supports a 4 by 4 plex of AgileTV™ engines or speech engines. Plex-nodes of this plex network would each contain an AgileTV™ engine or speech engine, containing two planes of 4 by 4 plex networks of plex-nodes each having at least two CPU's. Each CPU may contain at least dual instruction processors.

Such a system supports extremely large computing requirements, such as quantum mechanical modeling of long chain hydro-carbons, or a video server for a population such as a district of a city, e.g. Brooklyn.

The 4 by 4 plex of AgileTV™ speech engines readily fits into an 8 ft (2.6 meter) by 10 ft (3.3 meter) closet by 8 foot (2.6 meter) ceiling. The system is estimated to handle speech recognition for 560,000 cable subscribers with

more than 30,000 users talking, with 20-30 gigabits bandwidth exchanged for the user community being served by such cable television systems. The system would exceed the raw compute performance of ASCI White, the world's fastest supercomputer installed at Lawrence Livermore Laboratories in the year 2000.

The AgileTV™ engine provides MPEG throttling techniques enabling support of more users than would otherwise be possible without such intelligent bandwidth management.

The AgileTV™ engine further supports designating a specific subset of plex-nodes, and coupling each plex-node of the subset to at least one additional processor. This provides communication to additional communication pencils connecting to other systems components, which may be additional plex communication networks of processor plex-nodes and may also enhance the security of multiple applications through partitioning.

Communication pencils intersecting at a plex-node provide a hierarchical connection methodology supporting arbitrarily large collections of concurrent computing resources. The communication delay to traverse such a system may grow on the order of the logarithm of the number of computing resource plex-nodes interconnected by these communication pencils.

The methodology using these innovations provides a remarkably large amount of computing resources coupling to almost any communications protocol.

The application of this methodology to cable television networks, with extremely limited upstream communication bandwidth, enables voice

recognition over cable television, in turn enabling a breakthrough in user friendliness unattainable in the home entertainment environment today.

The further application of this methodology supporting user site addressing and the identification of user voices associated with the user site aids the responsiveness of such systems.

An internet browser may execute on a processor in the AgileTV™ engine, decomposing the browser view into pixel frames, which are processed into a MPEG stream, and sent to the frequency up converters, etc.

Consider voice actuated interactive game playing. Large motion video sequences may be placed on a game server. The playing of the appropriate motion video sequences may be controlled by voice commands using the game server as a local VOD server to the head-end node, communicating through a sufficiently high-speed and responsive communication mechanism, which could be the Internet.

Interactive gambling is supported across cable television networks.

Interactive shopping, based upon shopping content placed on a VOD server and activated through the speech recognition responses of the AgileTV™ engine, is supported.

Interactive auctioning is supported across cable television networks.

Interactive voice communications applications are supported across cable television networks.

The preceding embodiments of the invention have been provided by way of example and are not meant to constrain the scope of the following claims.

Claims

1. A method of using a back channel containing a multiplicity of identified speech channels from a multiplicity of user sites presented to a speech processing system at a wireline node in a network supporting at least one of cable television delivery and video delivery, comprising the steps of:

receiving said back channel to create a received back channel;

partitioning said received back channel into a multiplicity of received identified speech channels;

processing said multiplicity of said received identified speech channels to create a multiplicity of identified speech content; and

responding to said identified speech content to create an identified speech content response that is unique, for each of said multiplicity of identified speech contents.

2. The method of Claim 1,

wherein at least one of said identified speech channels has an associated user site; and

wherein the step partitioning said received back channel is further comprised of the step of:

partitioning said received back channel into a multiplicity of said received identified speech channels from said associated user site;

wherein the step processing said multiplicity of said received identified speech channels is further comprised the step of:

processing said multiplicity of said received identified speech channels from said associated user site to create a multiplicity of said identified speech contents; and

wherein the step responding to said identified speech content is further comprised the step of:

responding to said identified speech content from said associated user site to create said identified speech content response for said associated user site.

3. The method of Claim 2,

further comprising at least one member of the collection containing the steps of:

determining said associated user site from said received identified speech channel;

determining said associated user site from said identified speech content;

determining said associated user site from said identified speech content and a speaker identification library;

determining said associated user site from said identified speech content and a speech recognition library; and

determining said associated user site from an identification within said speech channel.

4. The method of Claim 2,

wherein the step responding to said identified speech contents from said associated user site is comprised of the steps of:

processing said identified speech content response to create said identified user site response; and

sending said identified user site response to said identified user site.

5. The method of Claim 2,

wherein the step responding to said identified speech contents from said associated user site is comprised of the steps of:

assessing said speech content response identified as to said user site to create a financial consequence identified as to said user site; and
5 billing said user site based upon said financial consequence.

6. The method of Claim 2,

wherein the step responding to said identified speech contents from said associated user site is comprised of the steps of:

assessing said speech response to create a financial consequence
10 identified with said user site;

displaying said financial consequence to create a displayed financial consequence at said user site;

confirming said displayed financial consequence from said user site to create a financial commitment; and

15 billing said user site based upon said financial commitment.

7. The method of Claim 6,

wherein the step responding to said identified speech contents from said associated user site is comprised of the steps of:

identifying a user based upon said speech content identified as to said
20 user site to create an identified user.

8. The method of Claim 7,

wherein the step identifying said user is comprised of the steps of:

fetching a user profile list based upon said user site, said user profile list containing at least one user profile;

identifying said user based upon said speech content and based upon said user profile list to create an identified user.

9. The method of Claim 8,

wherein the step assessing said speech response is further comprised
5 of the step of:

assessing said speech response based upon said identified user to create a financial consequence for said identified user.

10. The method of Claim 2,

wherein said speech content response is comprised of a current
10 response menu and a cumulative user site response is identified as to said user site for at least one of said user sites.

11. The method of Claim 10,

wherein the step responding to said identified speech content from said associated user site further comprising at least one member of the collection
15 comprising the steps of:

responding to said speech content based upon said current response menu and based upon said cumulative user site response to create a new cumulative user site response; and

assessing said speech content based upon said current response
20 menu and based upon said cumulative user site response to create a new current response menu.

12. The method of Claim 2,

wherein the step responding to said identified speech content from said associated user site is further comprised of the step of:

responding to said speech content identified as to said user site based upon natural language to create a speech content response of said speech content identified with said user site.

13. The method of Claim 2,

5 wherein the step processing said multiplicity of said received speech channels is further comprised for at least one of said user sites is further comprised of the step of:

processing said received speech channels from said user site based upon natural language for said user site to create said speech content
10 identified as to said user site.

14. A program system controlling at least part of a speech recognition system coupled to a wireline node in a network, said program system comprising the program steps of:

processing a multiplicity of received identified speech channels to
15 create a multiplicity of identified speech content; and

responding to said identified speech content to create an identified speech content response that is unique to each of said multiplicity of identified speech contents;

wherein said speech recognition system is provided said multiplicity of
20 received identified speech channels based upon a received back channel at said wireline node from a multiplicity of user sites coupled to said network;

wherein each of said program steps reside in memory accessibly coupled to at least one computer included in said speech recognition system;

wherein said at least one computer communicatively couples through
25 said wireline node to said multiplicity of user sites; and

wherein said network supports at least one of the collection comprising:
cable television delivery to said multiplicity of user sites; and video delivery to
said multiplicity of user sites.

15. The program system of Claim 14,

5 wherein at least one of said identified speech channels has an
associated user site; and

wherein the program step processing said multiplicity of said received
identified speech channels is further comprised of the program step of:

processing said multiplicity of said received identified speech channels
10 from said associated user site to create a multiplicity of said identified speech
content; and

wherein the program step responding to said identified speech content
is further comprised of the program step of:

responding to said identified speech content from said associated user
15 site to create said identified speech content response for said associated user
site.

16. The program system of Claim 15,

further comprising at least one member of the collection containing the
program steps of:

20 determining said associated user site from said received identified
speech channel;

determining said associated user site from said identified speech
content;

determining said associated user site from said identified speech
25 content and a speaker identification library;

determining said associated user site from said identified speech content and a speech recognition library; and

determining said associated user site from an identification within said speech channel.

5 17. The program system of Claim 15,
wherein the program step responding to said identified speech content from said associated user site is comprised of the program steps of:

processing said identified speech content response to create said identified user site response; and

10 sending said identified user site response to said identified user site.

18. The program system of Claim 15,
wherein the program step responding to said identified speech content from said associated user site is comprised of the program steps of:

assessing said speech content response identified as to said user site
15 to create a financial consequence identified as to said user site; and
billing said user site based upon said financial consequence.

19. The program system of Claim 15,
wherein the program step responding to said identified speech content from said associated user site is comprised of the program steps of:

20 assessing said speech response to create a financial consequence identified as to said user site;

displaying said financial consequence to create a displayed financial consequence at said user site;

confirming said displayed financial consequence from said user site to
25 create a financial commitment; and

billing said user site based upon said financial commitment.

20. The program system of Claim 19,

wherein the program step responding to said identified speech contents from said associated user site is comprised of the program steps of:

5 identifying a user based upon said speech content identified as to said user site to create an identified user.

21. The program system of Claim 20,

wherein the program step identifying said user is comprised of the program steps of:

10 fetching a user profile list based upon said user site, said user profile list containing at least one user profile;

identifying said user based upon said speech content and based upon said user profile list to create an identified user.

22. The program system of Claim 21,

15 wherein the program step assessing said speech response is further comprised of the program step of:

assessing said speech response based upon said identified user to create a financial consequence for said identified user.

23. The program system of Claim 15,

20 wherein said speech content response is comprised of a current response menu and a cumulative user site response identified as to said user site for at least one of said user sites.

24. The program system of Claim 23,

wherein the program step responding to said identified speech contents from said associated user site is further comprised of at least one member of the collection comprising the program steps of:

responding to said speech contents based upon said current response menu and based upon said cumulative user site response to create a new cumulative user site response; and

assessing said speech contents based upon said current response menu and based upon said cumulative user site response to create a new current response menu.

25. The program system of Claim 15,

wherein the program step responding to said identified speech content from said associated user site is comprised, for at least one of said user sites, of the program step of:

responding to said speech content identified as to said user site based upon natural language to create a speech content response of said speech contents identified as to said user site.

26. The program system of Claim 15,

wherein the program step processing said multiplicity of said received speech channels is further comprised, for at least one of said user sites, of the program step of:

processing said received speech channels from said user site based upon natural language for said user site to create said speech content identified as to said user site.

27. A system supporting speech recognition in a network, said system comprising:

a speech recognition system coupled to a wireline node in said network for receiving a back channel from a multiplicity of user sites coupled to said network, further comprising

a back channel receiver, for receiving said back channel to create a
5 received back channel;

a speech channel partitioner, for partitioning said received back channel into a multiplicity of received identified speech channels; and

a processor network executing a program system comprised of program steps residing in memory accessibly coupled to at least one
10 computer in said processor network;

wherein said program system is comprised of the program steps of:

processing said multiplicity of said received identified speech channels to create a multiplicity of identified speech content;

responding to said identified speech content to create an identified
15 speech content response, for each of said multiplicity of said identified speech contents; and

wherein said network supports at least one of the collection comprising: cable television delivery to said multiplicity of user sites; and video delivery to said multiplicity of user sites.

20 28. The system of Claim 27,

wherein at least one of said identified speech channels has an associated user site; and

wherein partitioning said received back channel is further comprised of:

partitioning said received back channel into a multiplicity of said
25 received identified speech channels from said associated user site;

wherein the program step processing said multiplicity of said received identified speech channels is further comprised of the program step of:

processing said multiplicity of said received identified speech channels from said associated user site to create a multiplicity of said identified speech content; and

wherein the program step responding to said identified speech content is further comprised of the program step of:

responding to said identified speech content from said associated user site to create said identified speech content response for said associated user site.

29. The system of Claim 28,

wherein said program system is further comprised of at least one of the collection comprising the program steps of:

determining said associated user site from said received identified speech channel;

determining said associated user site from said identified speech content;

determining said associated user site from said identified speech content and a speaker identification library;

determining said associated user site from said identified speech content and a speech recognition library; and

determining said associated user site from an identification within said speech channel.

30. The system of Claim 28,

wherein the program step responding to said identified speech contents from said associated user site is comprised of the program steps of:

processing said identified speech content response to create said identified user site response; and

5 sending said identified user site response to said identified user site.

31. The system of Claim 28,

wherein the program step responding to said identified speech contents from said associated user site is comprised of the program steps of:

assessing said speech content response identified as to said user site
10 to create a financial consequence identified as to said user site; and
billing said user site based upon said financial consequence.

32. The system of Claim 28,

wherein the program step responding to said identified speech content from said associated user site is comprised of the program steps of:

15 assessing said speech response to create a financial consequence identified as to said user site;

displaying said financial consequence to create a displayed financial consequence at said user site;

confirming said displayed financial consequence from said user site to
20 create a financial commitment; and
billing said user site based upon said financial commitment.

33. The system of Claim 32,

wherein the program step responding to said identified speech content from said associated user site is comprised of the program steps of:

identifying a user based upon said speech content identified as to said user site to create an identified user.

34. The system of Claim 33,

wherein the program step identifying said user is comprised of the program steps of:

fetching a user profile list based upon said user site, said user profile list containing at least one user profile;

identifying said user based upon said speech content and based upon said user profile list to create an identified user.

35. The system of Claim 34,

wherein the program step assessing said speech response is further comprised of the program step of:

assessing said speech response based upon said identified user to create a financial consequence for said identified user.

36. The system of Claim 28,

wherein said speech content response is comprised of a current response menu and a cumulative user site response identified as to said user site for at least one of said user sites.

37. The system of Claim 36,

wherein the program step responding to said identified speech content from said associated user site is further comprised of at least one member of the collection comprising the program steps of:

responding to said speech content based upon said current response menu and based upon said cumulative user site response to create a new cumulative user site response; and

assessing said speech contents based upon said current response
5 menu and based upon said cumulative user site response to create a new current response menu.

38. The system of Claim 28,

wherein the program step responding to said identified speech content from said associated user site is comprised, for at least one of said user sites,
10 of the program step of:

responding to said speech content identified as to said user site based upon natural language to create a speech content response of said speech contents identified as to said user site.

39. The system of Claim 28,

15 wherein the program step processing said multiplicity of said received speech channels is further comprised, for at least one of said user sites, of the program step of:

processing said received speech channels from said user site based upon natural language for said user site to create said speech content
20 identified as to said user site.

40. The system of Claim 28,

wherein said network includes a wired residential broadband network servicing at least part of said multiplicity of user sites.

41. The system of Claim 40,

wherein said wired residential broadband network is a fiber-to-the-curb residential broadband network.

42. The system of Claim 40,

wherein said wired residential broadband network is a fiber-to-the-home residential broadband network.

43. The system of Claim 40,

wherein said wired residential broadband network is a switched-digital-video residential broadband network.

44. The system of Claim 40,

wherein said wireline node is located proximate to a node in said wired residential broadband network.

45. The system of Claim 40,

wherein said wireline node is located proximate to a Headend in said wired residential broadband network.

46. The system of Claim 40,

wherein said wireline node is located proximate to a central office in said wired residential broadband network.

47. The system of Claim 27,

wherein said speech recognition system further comprises a two-dimensional plex communication network communicatively coupled with a two-dimensional array of plex-nodes.

48. The system of Claim 47,

wherein at least one of said plex-nodes is comprised of at least one computer communicatively coupled through said two-dimensional plex communication network to at least one of said multiplicity of user sites;

wherein said computer executes at least one of said program steps
5 residing in memory accessibly coupled to said computer.

49. The system of Claim 47,

wherein said back channel receiver is implemented in a first of said plex-nodes.

50. The system of Claim 47,

10 wherein said speech channel partitioner is implemented in a second of said plex-nodes.

51. The system of Claim 47,

wherein said two-dimensional communicatively coupled plex-node array and plex communications network contains said processor network.

15 52. The system of Claim 47,

wherein said processor network contains said two-dimensional communicatively coupled plex-node array and plex communications network.

53. A method of operating at least part of a speech recognition system coupled to a wireline node in a network, comprising the steps of:

20 processing a multiplicity of received identified speech channels to create a multiplicity of identified speech content; and

responding to said identified speech content to create an identified speech content response that is unique to each of said multiplicity of identified speech contents;

wherein said speech recognition system is provided said multiplicity of received identified speech channels based upon a received back channel at said wireline node from a multiplicity of user sites coupled to said network;

wherein said network supports at least one of the collection comprising:
5 cable television delivery to said multiplicity of user sites; and video delivery to said multiplicity of user sites.

54. The method of Claim 53,

wherein at least one of said identified speech channels has an associated user site; and

10 wherein the step processing said multiplicity of said received identified speech channels is further comprised of the step of:

processing said multiplicity of said received identified speech channels from said associated user site to create a multiplicity of said identified speech content; and

15 wherein the step responding to said identified speech content is further comprised of the step of:

responding to said identified speech content from said associated user site to create said identified speech content response for said associated user site.

20 55. The method of Claim 54,

wherein the step responding to said identified speech content from said associated user site is comprised of the steps of:

assessing said speech response to create a financial consequence identified as to said user site;

displaying said financial consequence to create a displayed financial consequence at said user site;

confirming said displayed financial consequence from said user site to create a financial commitment; and

5 billing said user site based upon said financial commitment.

56. The method of Claim 55,

wherein the step responding to said identified speech contents from said associated user site is comprised of the steps of:

10 identifying a user based upon said speech content identified as to said user site to create an identified user.

57. The method of Claim 56,

wherein the step identifying said user is comprised of the steps of:

fetching a user profile list based upon said user site, said user profile list containing at least one user profile;

15 identifying said user based upon said speech content and based upon said user profile list to create an identified user.

58. The method of Claim 57,

wherein the step assessing said speech response is further comprised of the step of:

20 assessing said speech response based upon said identified user to create a financial consequence for said identified user.

59. The method of Claim 54,

wherein said speech content response is comprised of a current response menu and a cumulative user site response identified as to said user site for at least one of said user sites.

60. The method of Claim 59,

wherein the step responding to said identified speech contents from said associated user site is further comprised of at least one member of the collection comprising the steps of:

responding to said speech contents based upon said current response menu and based upon said cumulative user site response to create a new cumulative user site response; and

assessing said speech contents based upon said current response menu and based upon said cumulative user site response to create a new current response menu.

61. The method of Claim 54,

wherein the step responding to said identified speech content from said associated user site is comprised, for at least one of said user sites, of the step of:

responding to said speech content identified as to said user site based upon natural language to create a speech content response of said speech contents identified as to said user site.

62. The method of Claim 54,

wherein the step processing said multiplicity of said received speech channels is further comprised, for at least one of said user sites, of the step of:

processing said received speech channel from said user site based upon natural language for said user site to create said speech content identified as to said user site.

63. The method of Claim 54,

5 further comprising at least one member of the collection containing the steps of:

determining said associated user site from said received identified speech channel;

10 determining said associated user site from said identified speech content;

determining said associated user site from said identified speech content and a speaker identification library;

determining said associated user site from said identified speech content and a speech recognition library; and

15 determining said associated user site from an identification within said speech channel.

64. The method of Claim 54,

wherein the step responding to said identified speech content from said associated user site is comprised of the steps of:

20 processing said identified speech content response to create said identified user site response; and

sending said identified user site response to said identified user site.

65. The method of Claim 54,

25 wherein the step responding to said identified speech content from said associated user site is comprised of the steps of:

assessing said speech content response identified as to said user site
to create a financial consequence identified as to said user site; and
billing said user site based upon said financial consequence.

66. The method of Claim 54,

5 wherein each of said identified speech channels has an associated
user site.

**SYSTEM AND METHOD OF SPEECH RECOGNITION NEAR A
WIRELINE NODE OF A NETWORK SUPPORTING CABLE
TELEVISION AND/OR VIDEO DELIVERY**

Abstract

- 5 A method and system of speech recognition presented by a back channel
from multiple user sites within a network supporting cable television and/or
video delivery is disclosed.

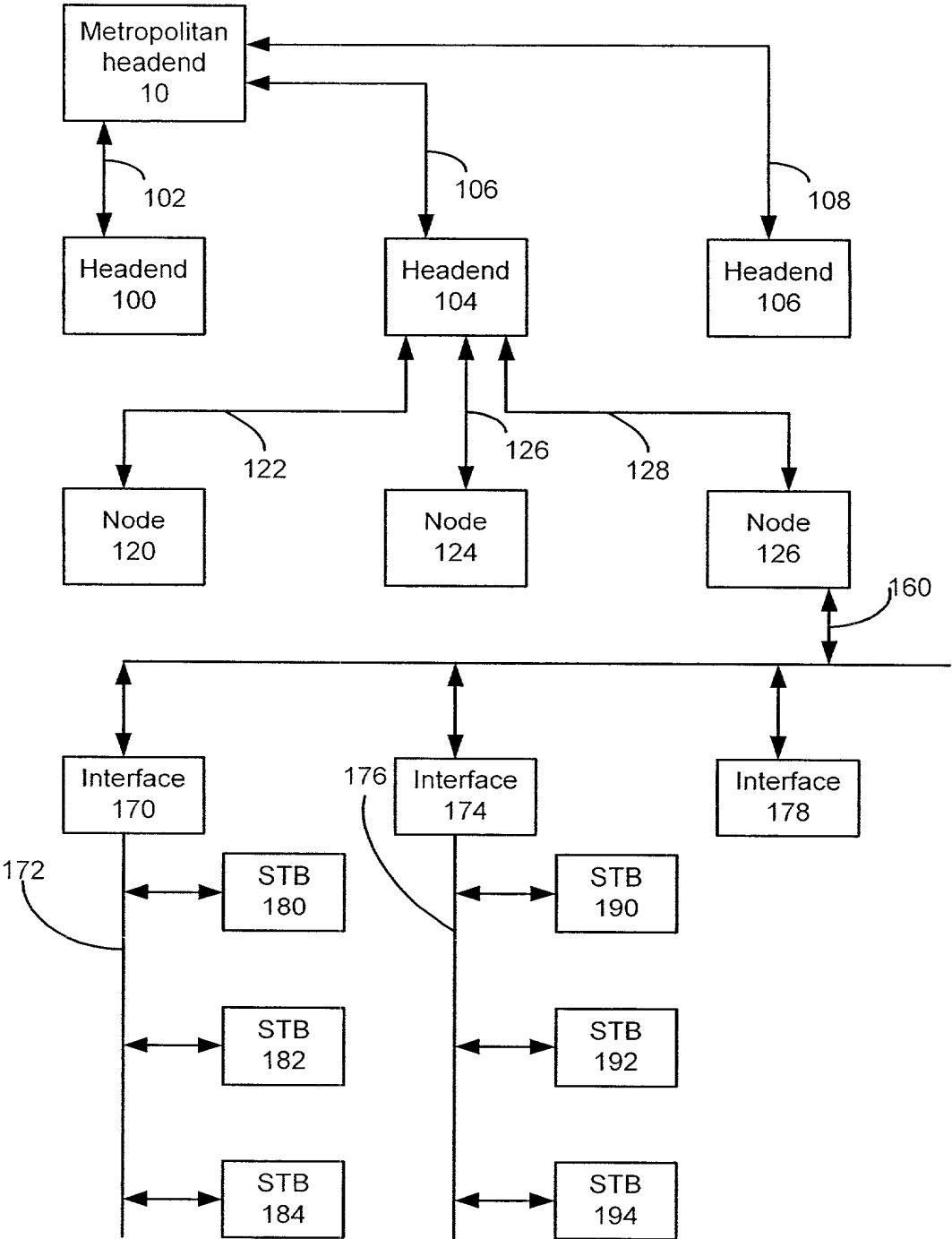


Fig. 1 Prior Art

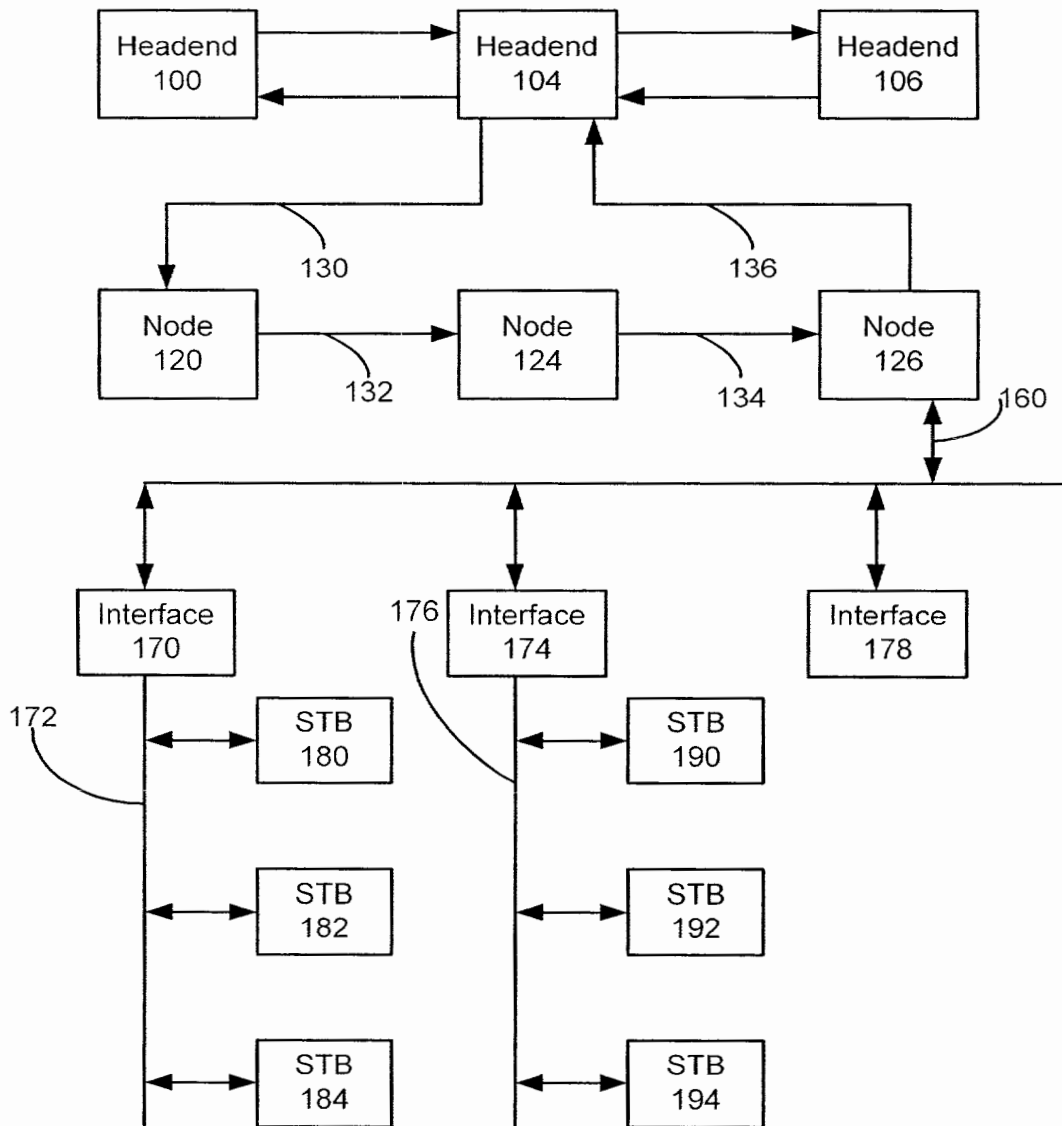


Fig. 2 Prior Art

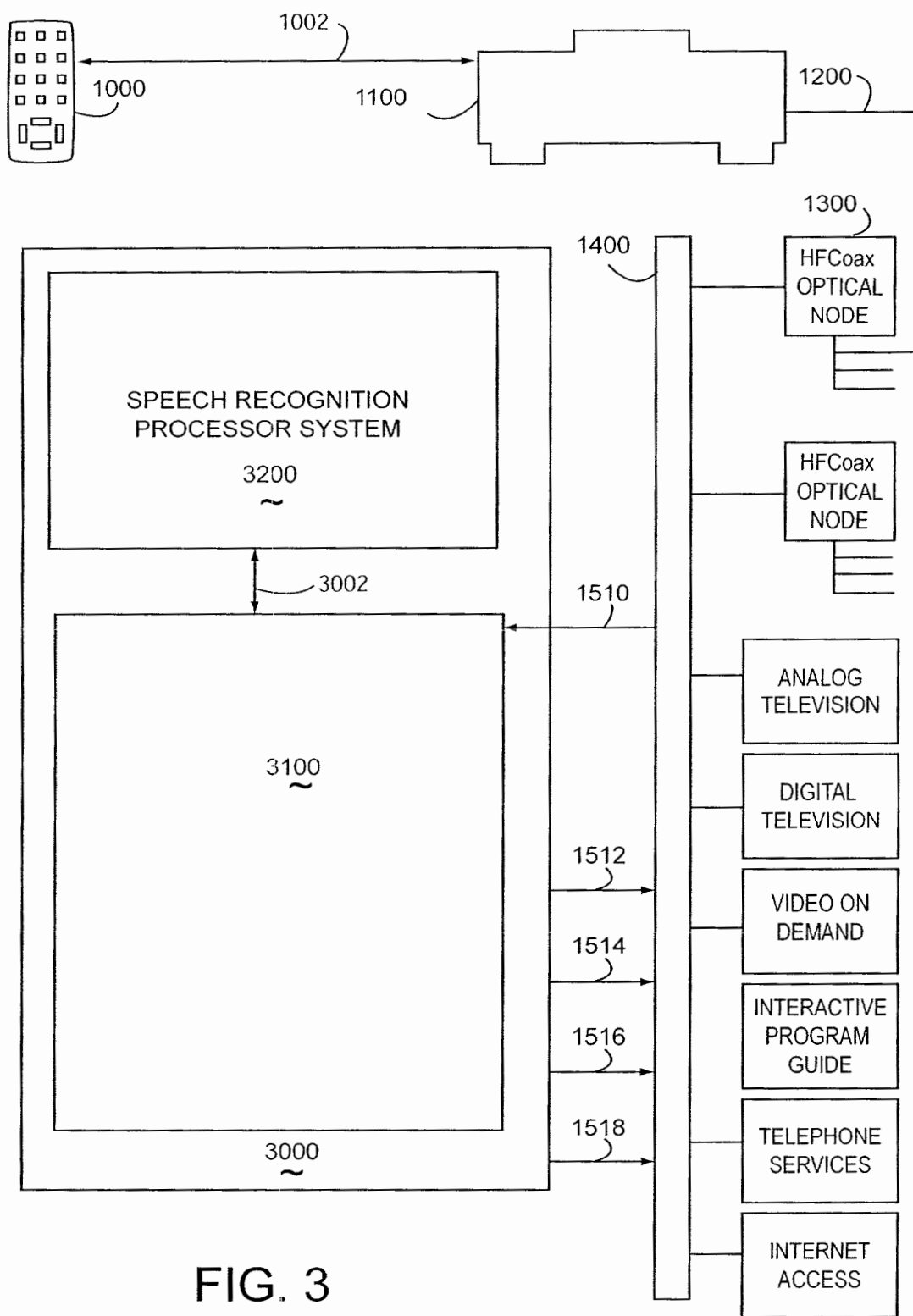
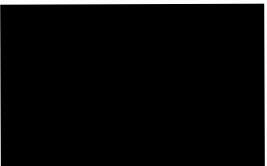


FIG. 3



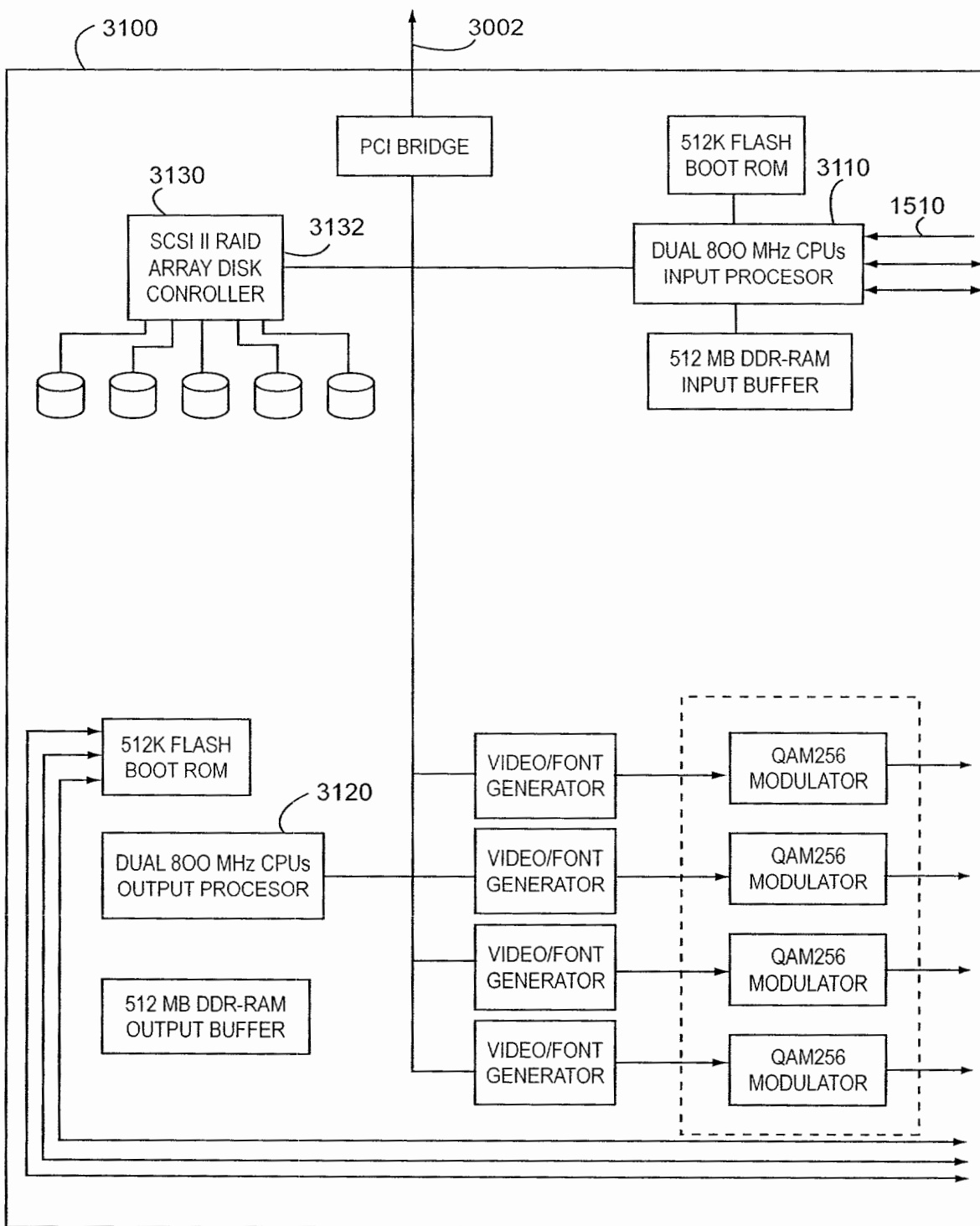


FIG. 5

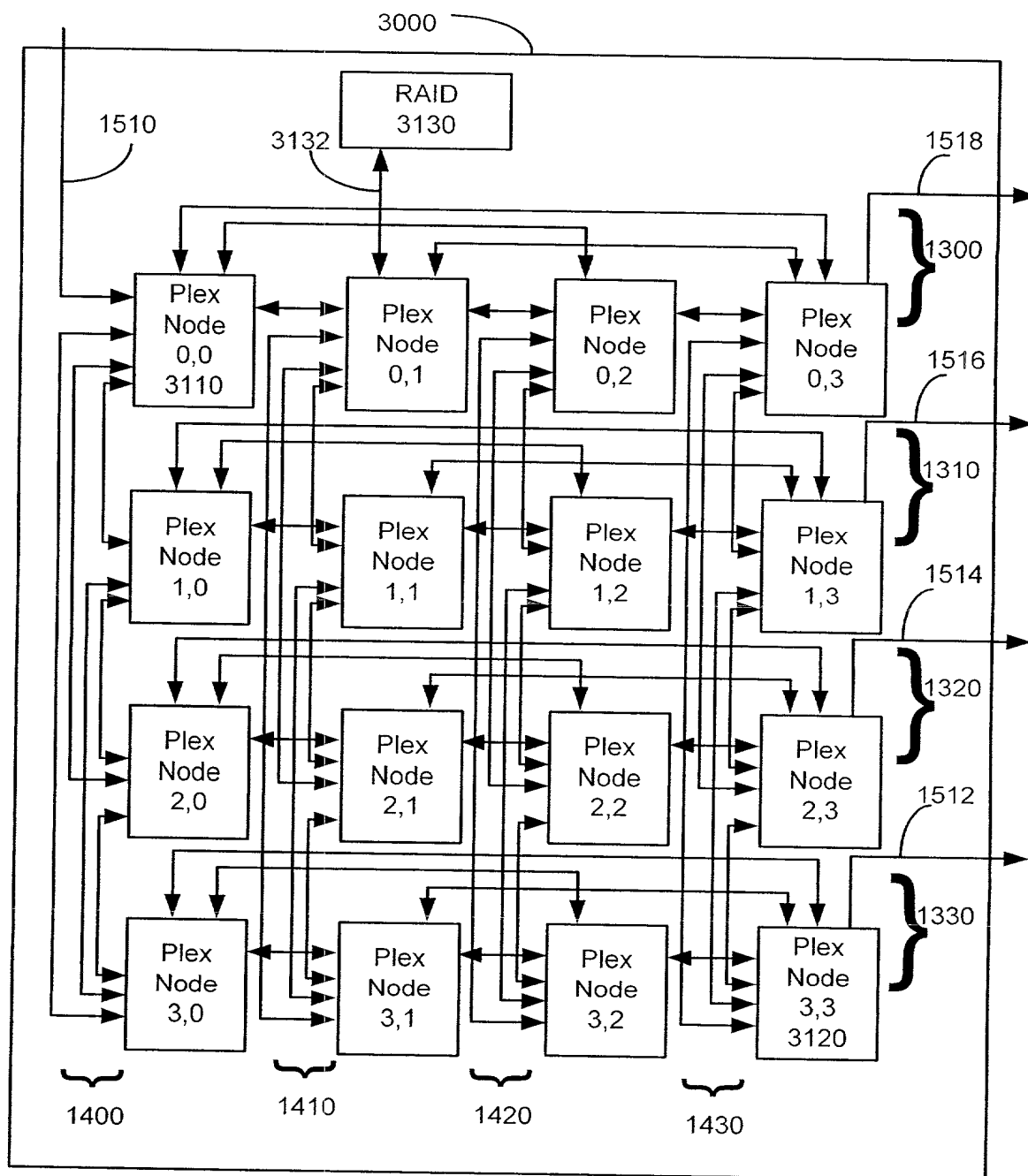


Fig. 6

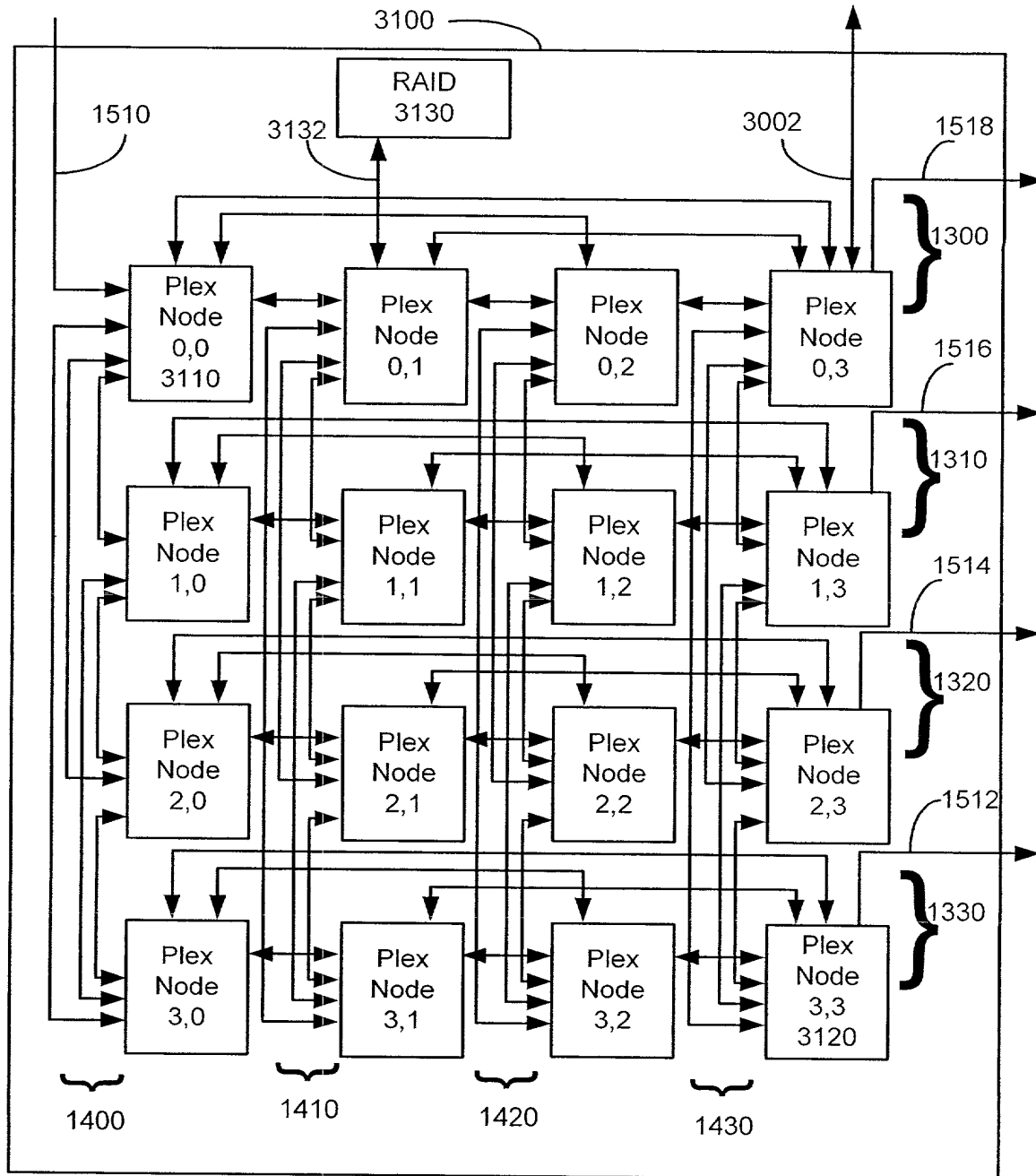


Fig. 7

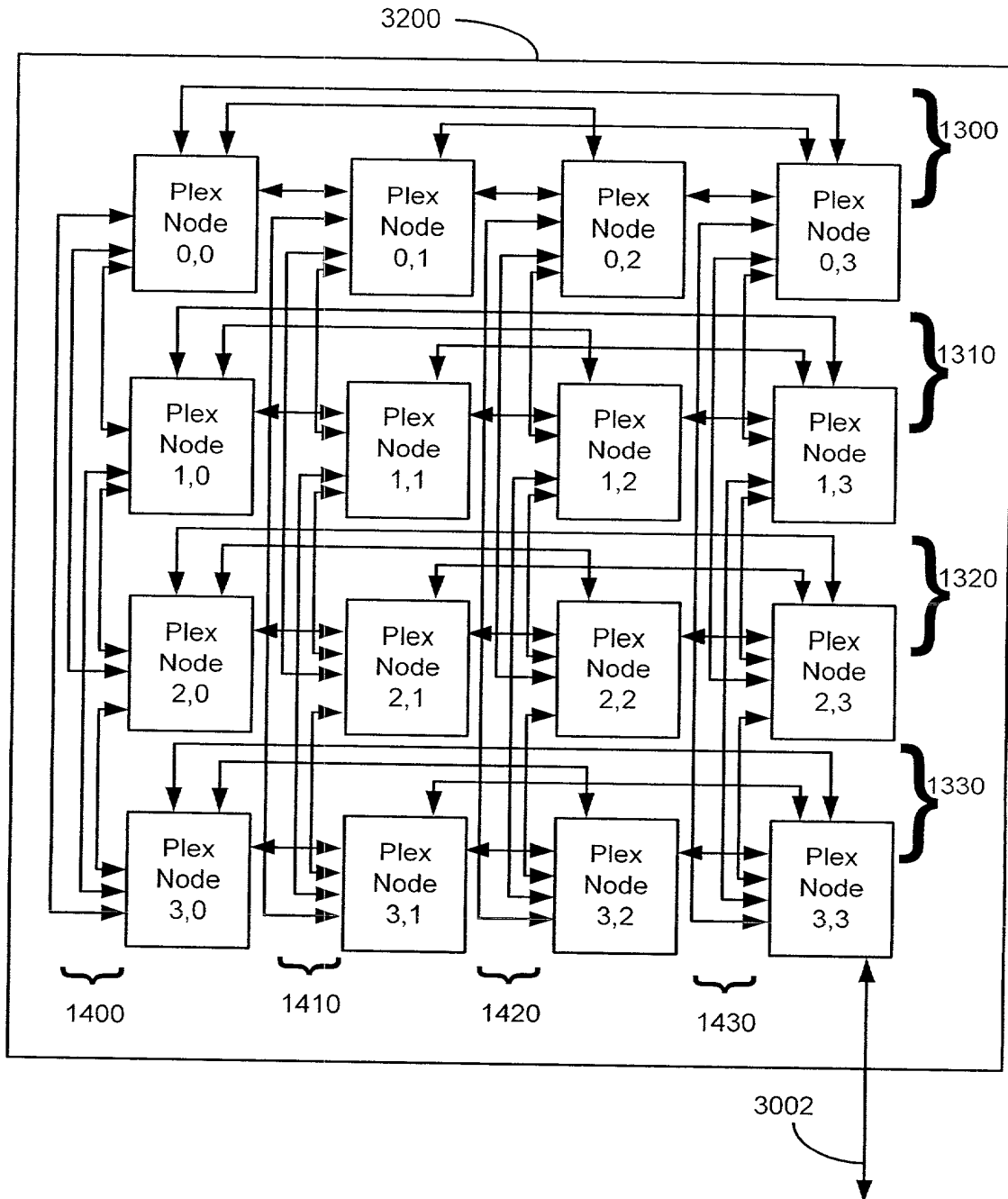


Fig. 8

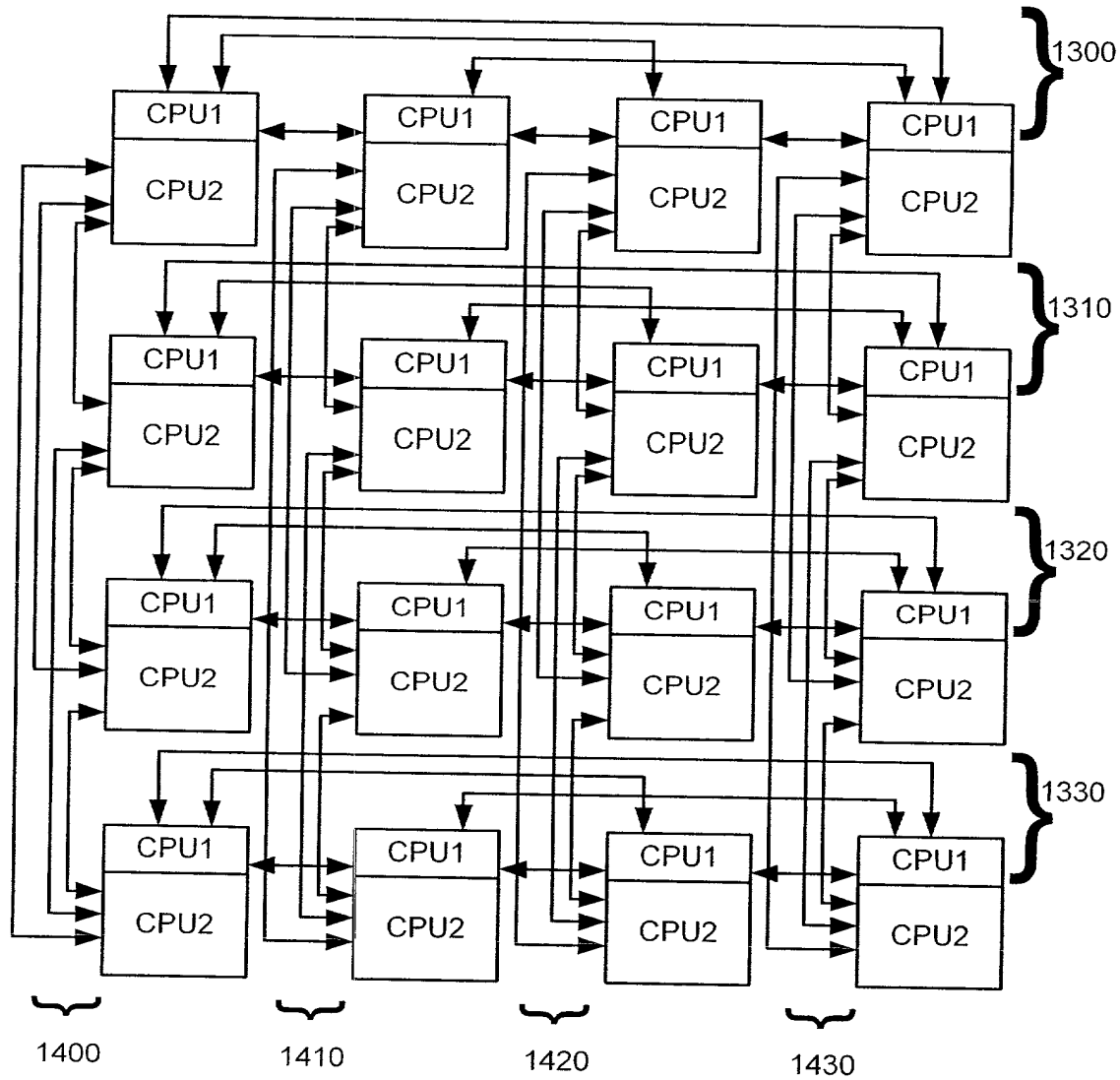


Fig. 9

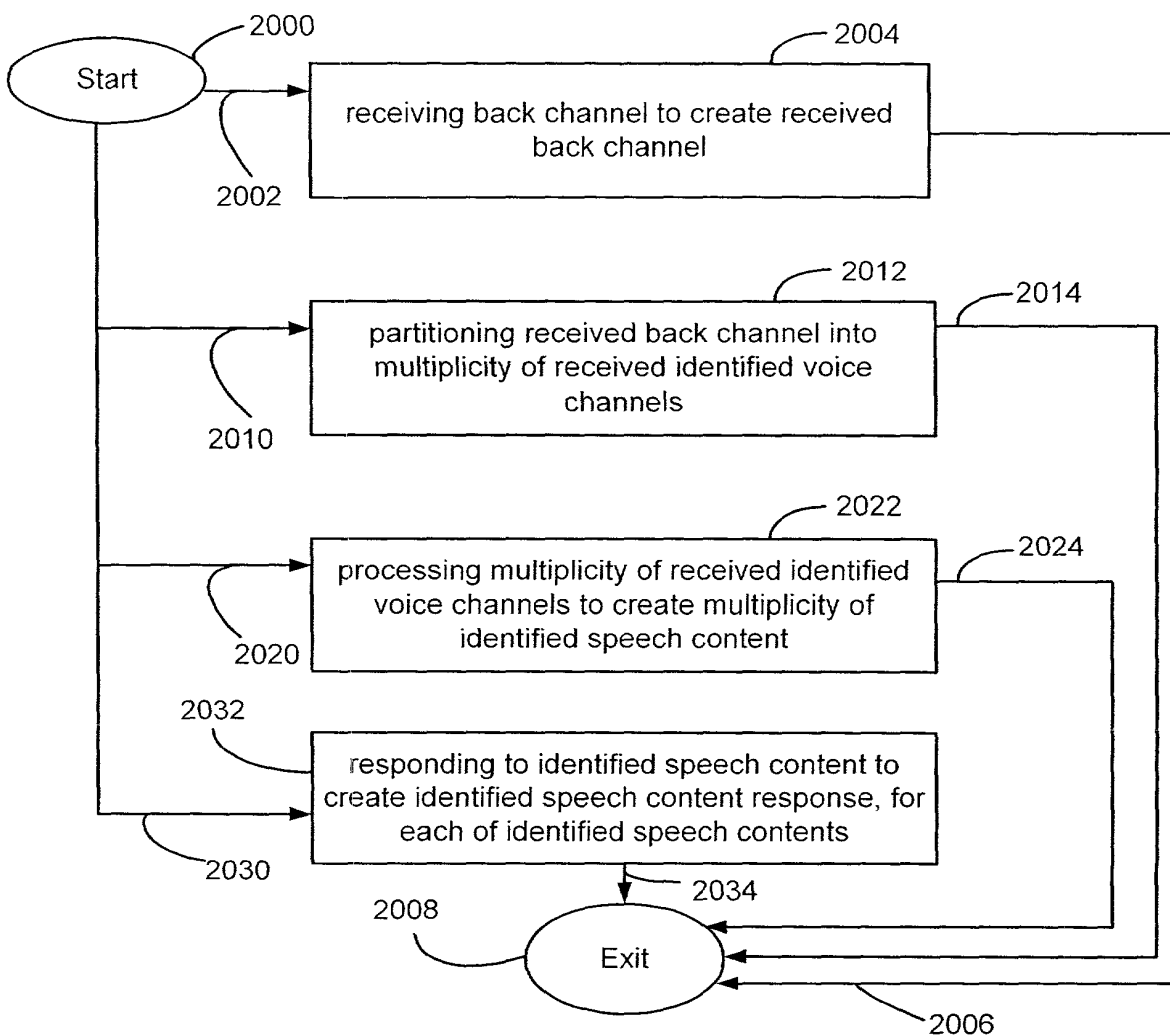


Fig. 10

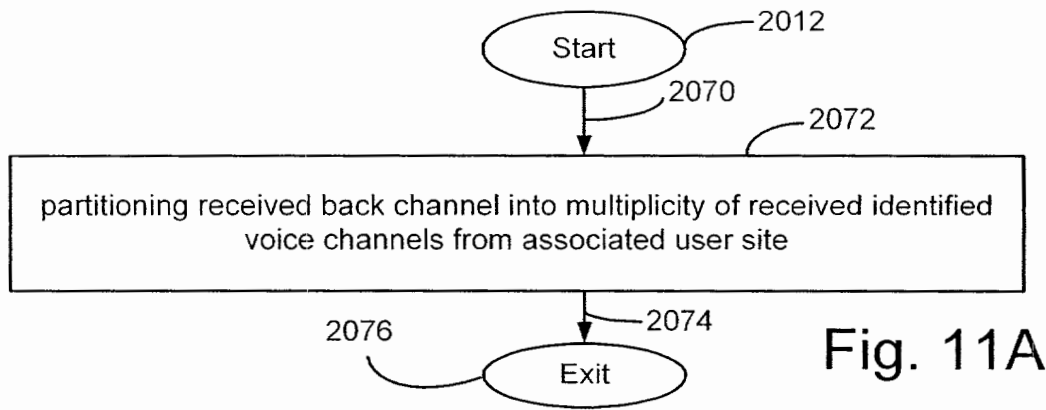


Fig. 11A

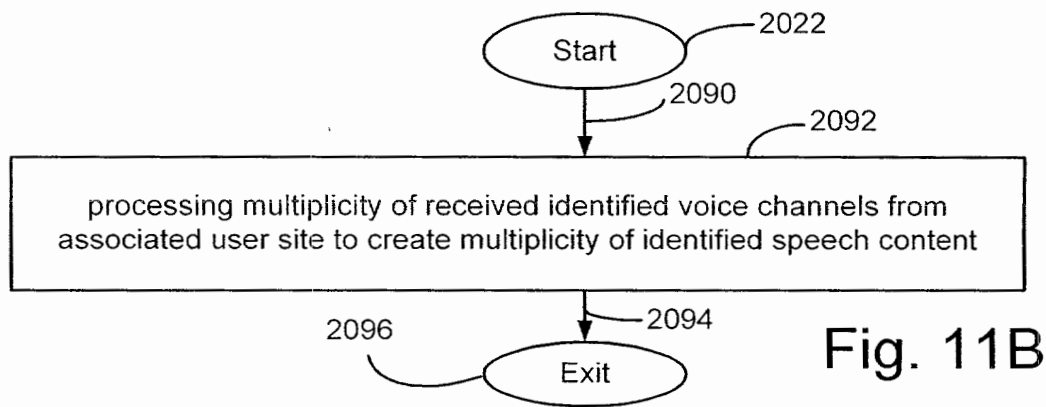


Fig. 11B

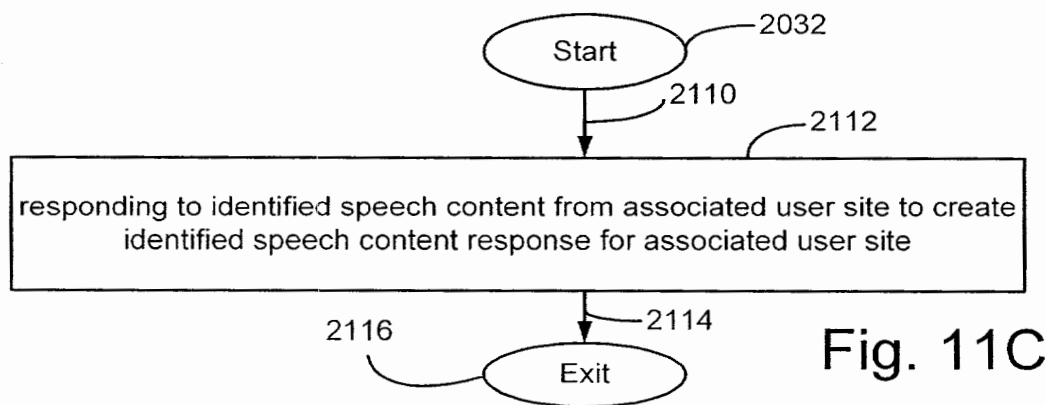


Fig. 11C

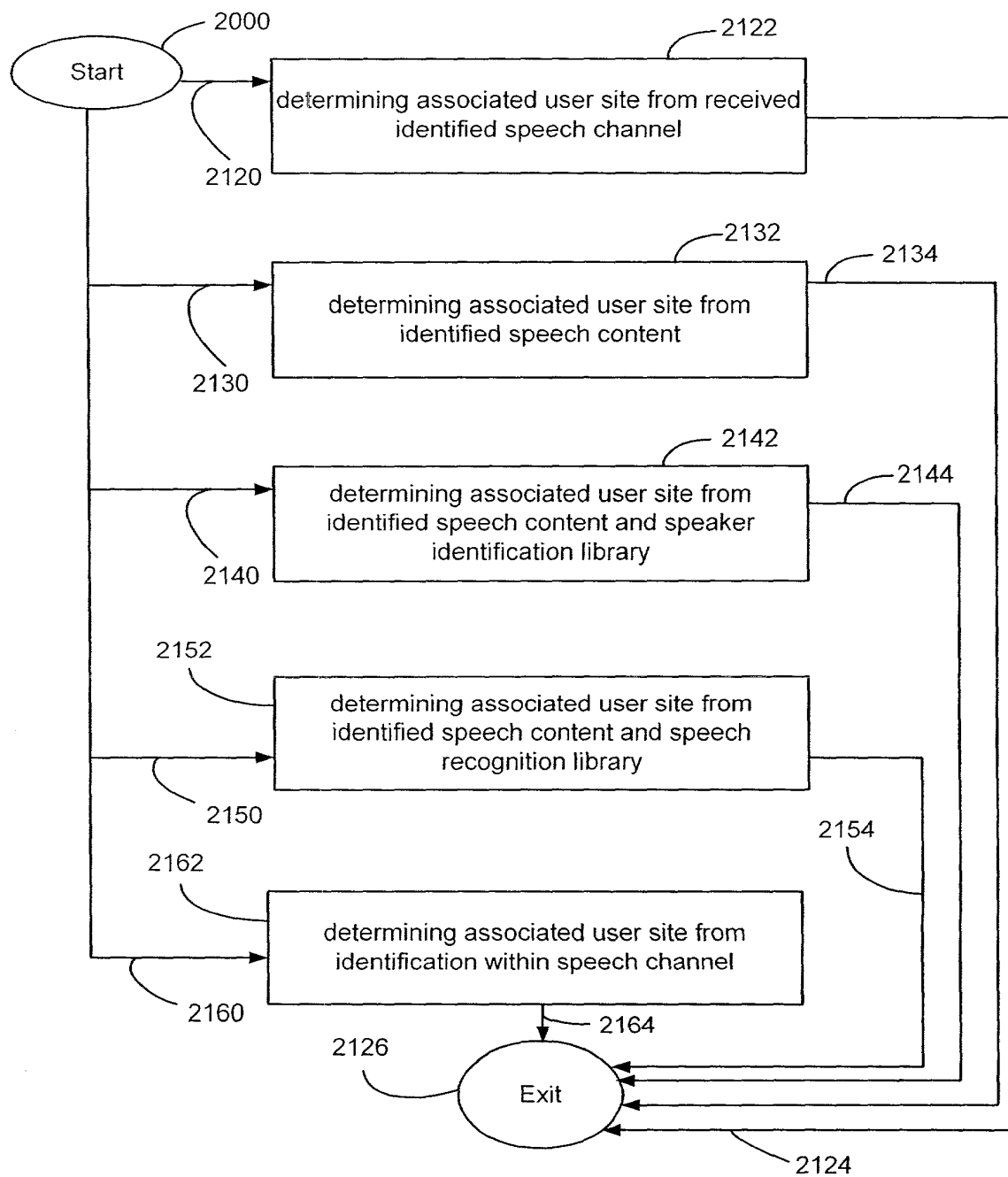
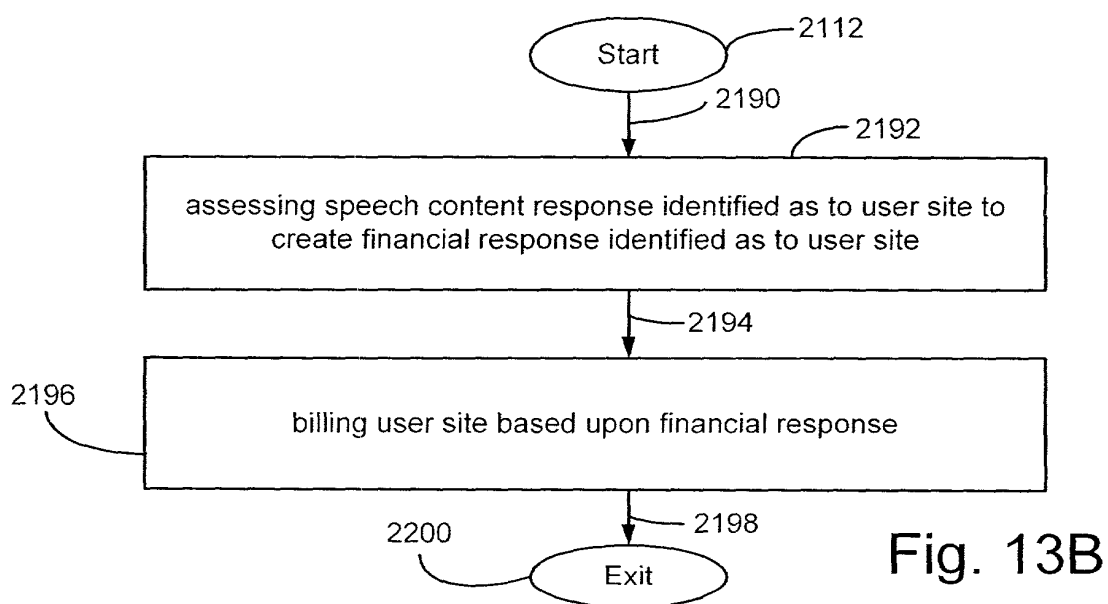
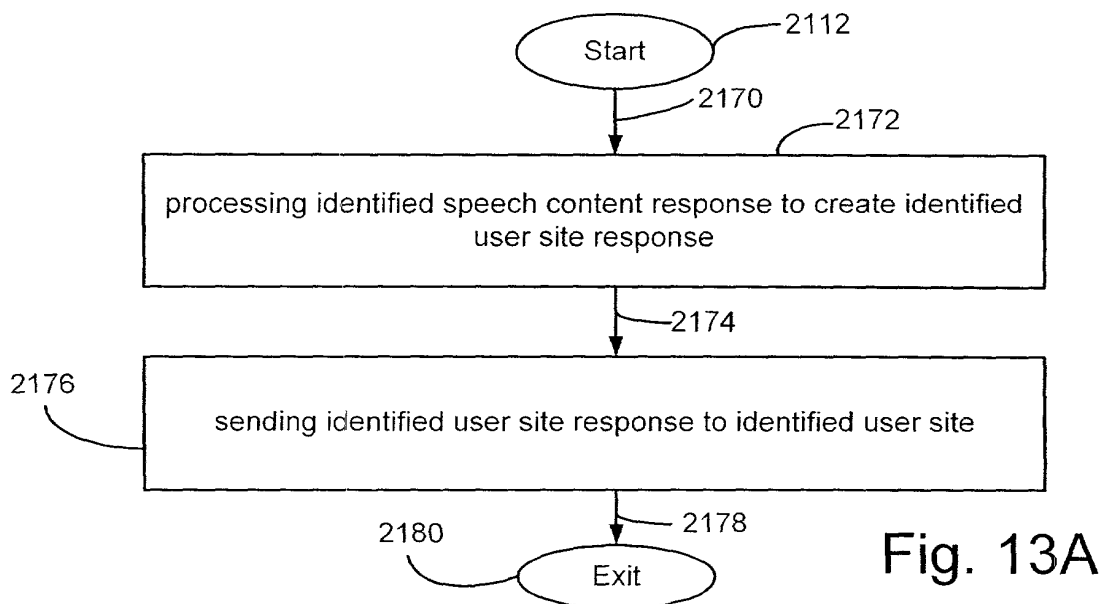


Fig. 12



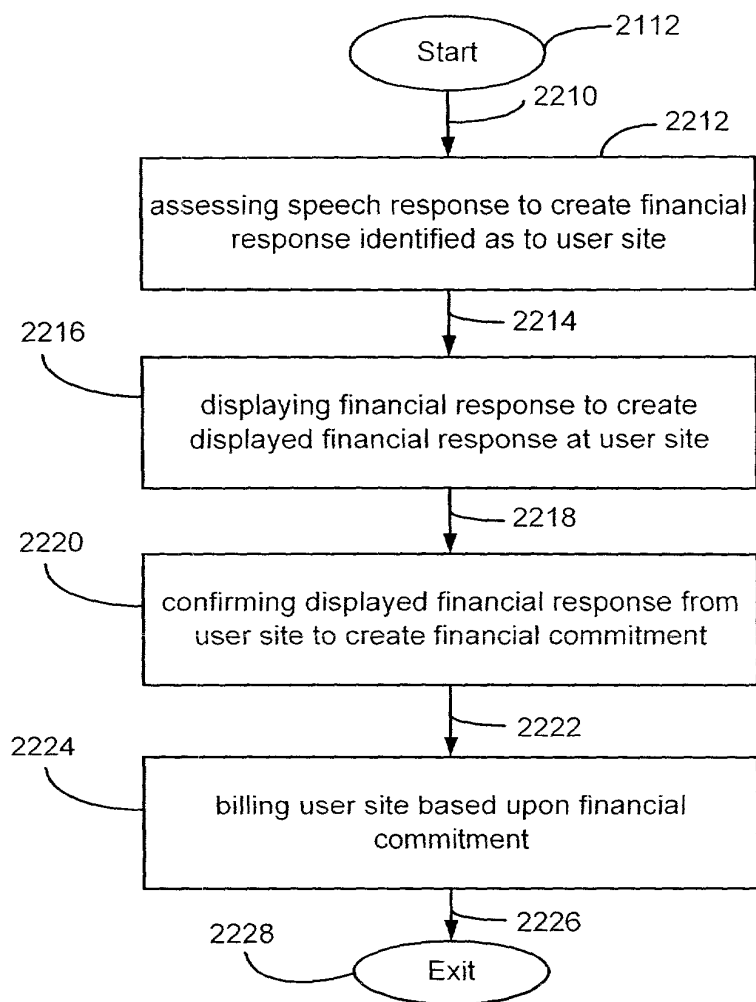
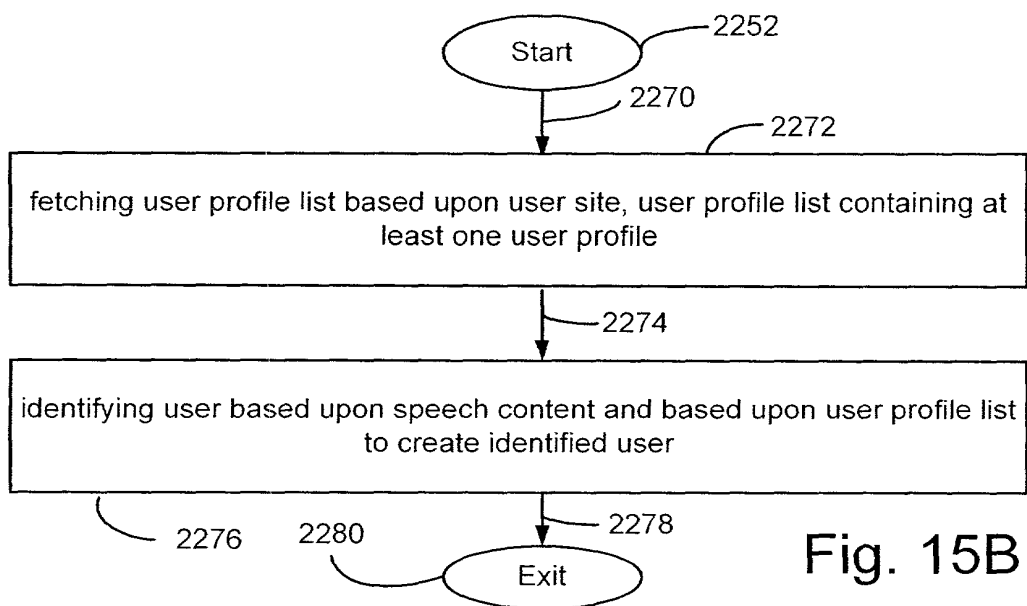
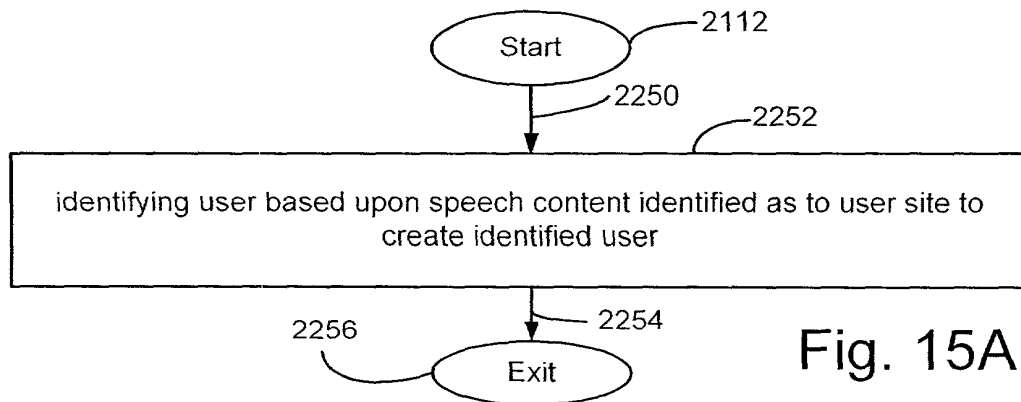


Fig. 14



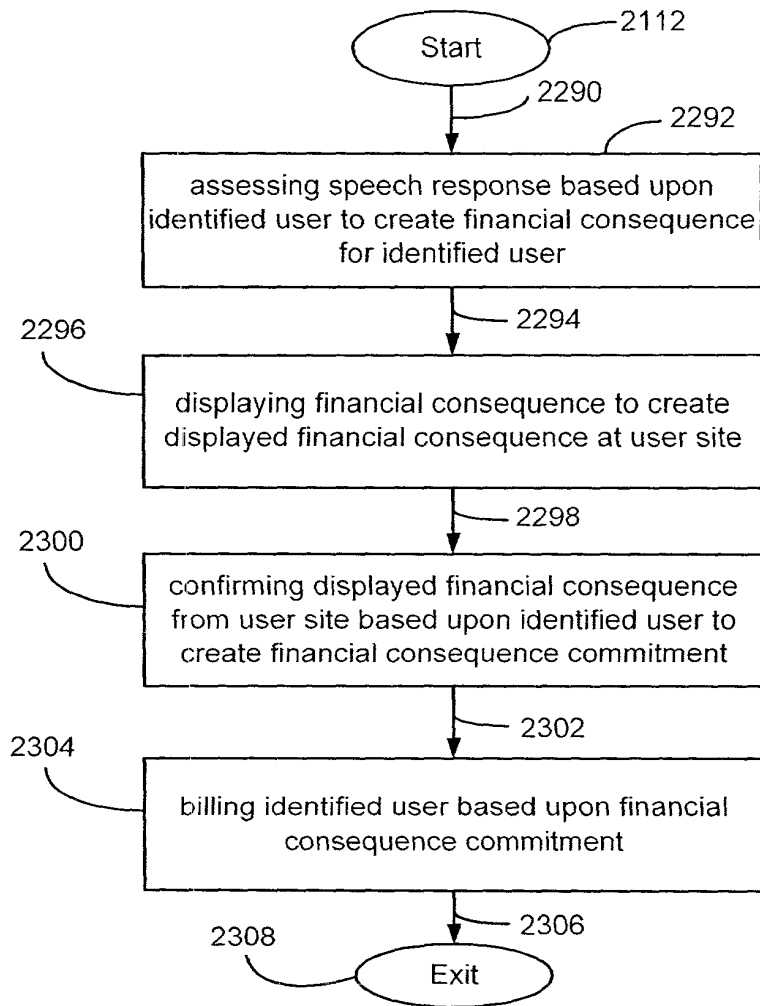


Fig. 16

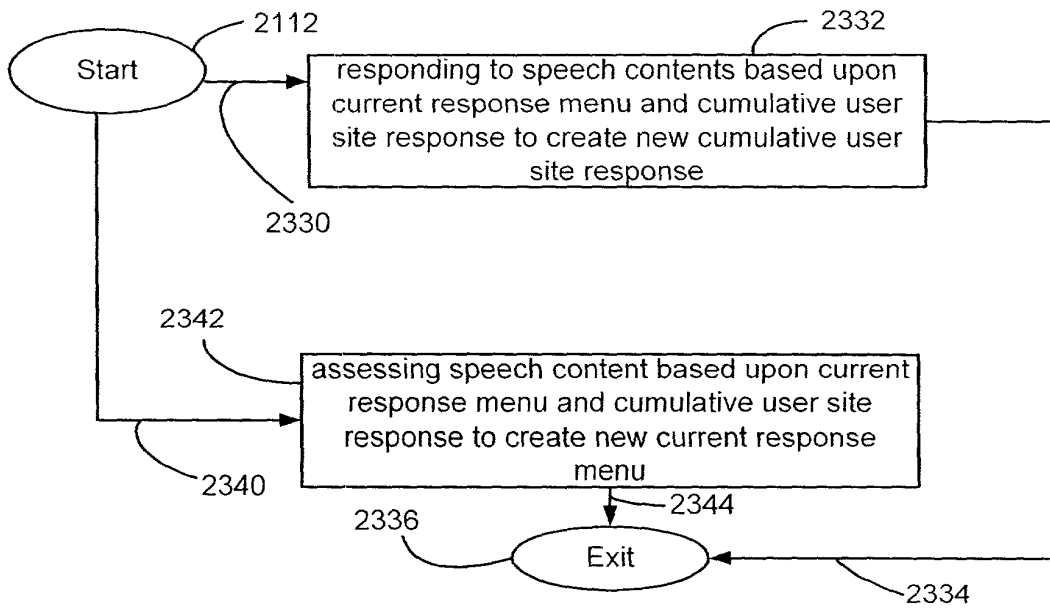


Fig. 17B

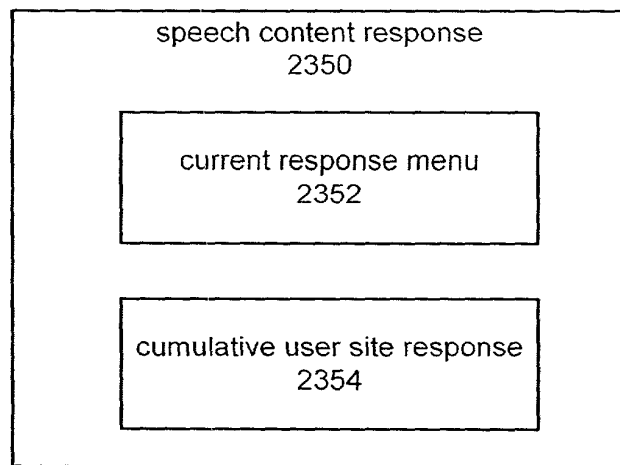
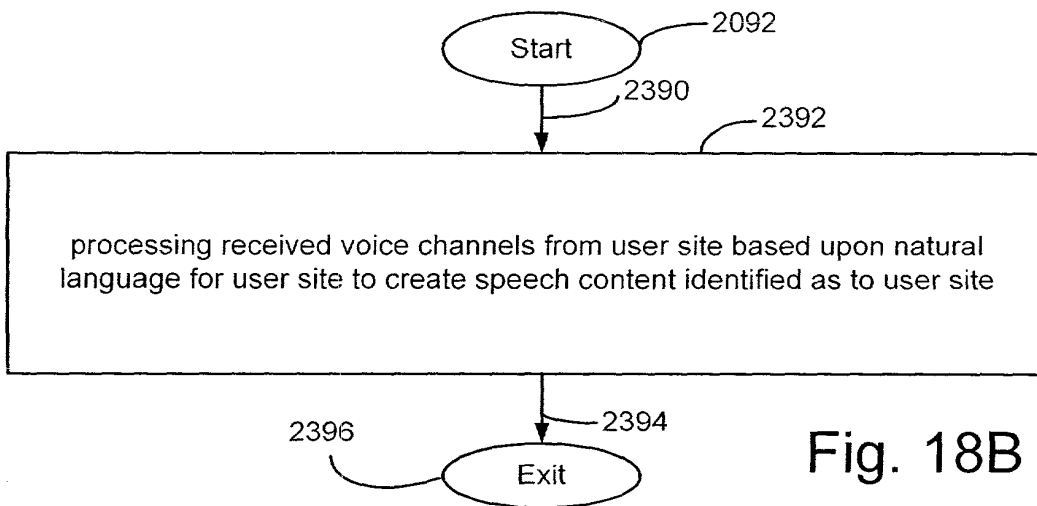
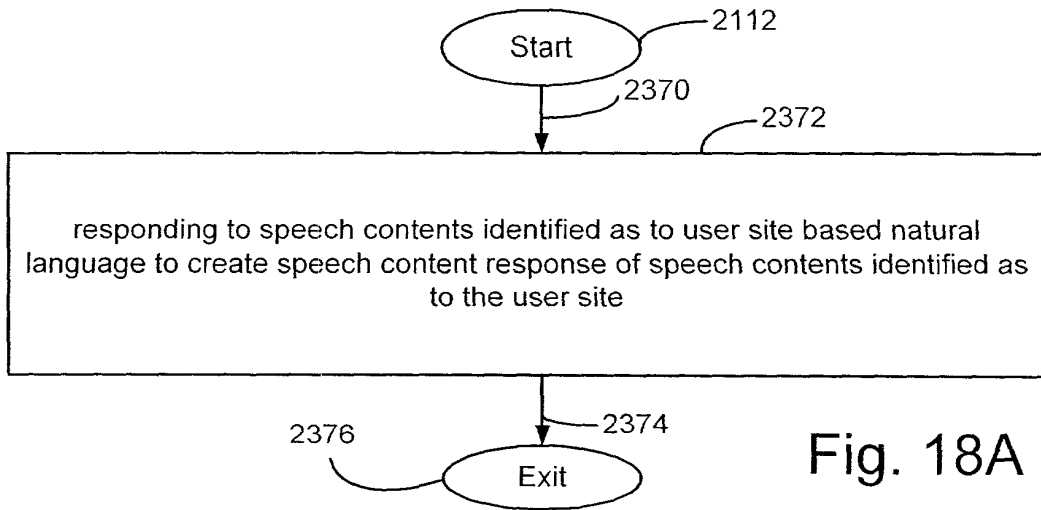


Fig. 17A



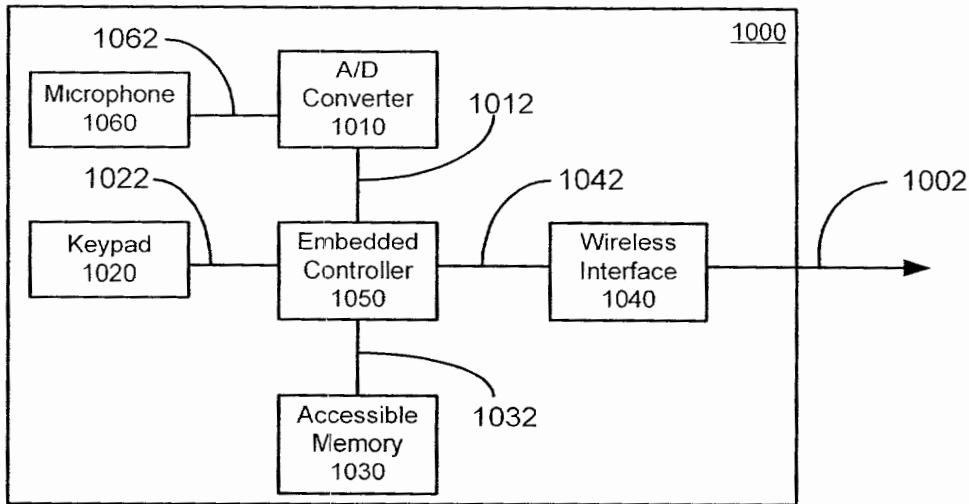


Fig. 19A

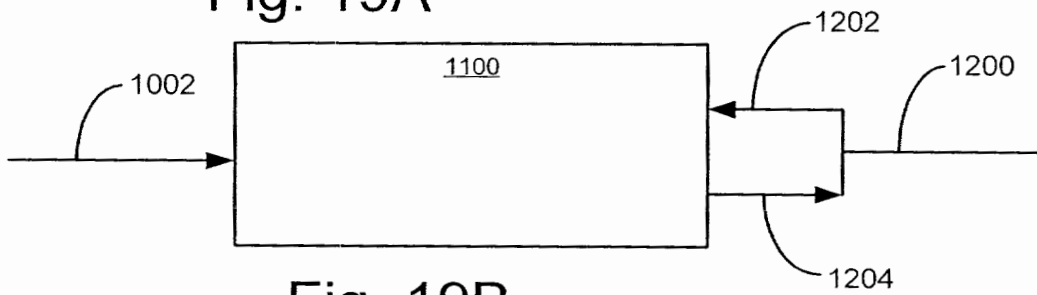


Fig. 19B

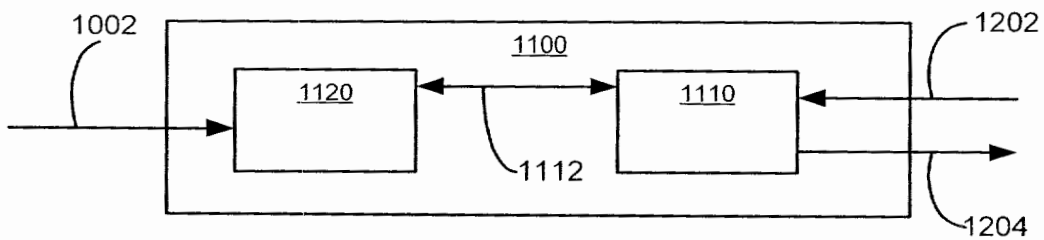


Fig. 19C

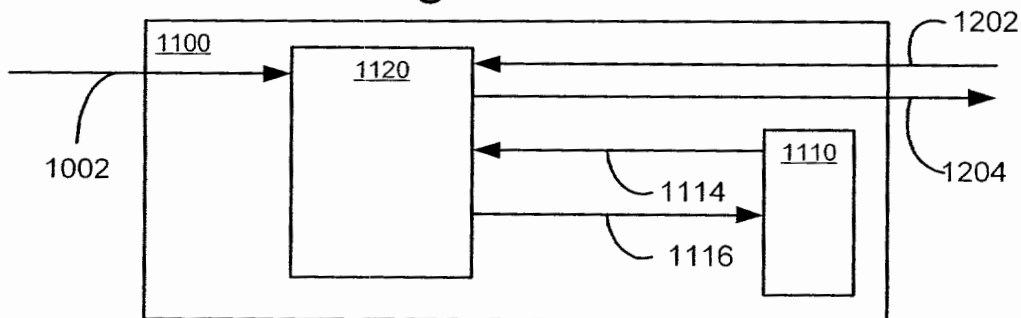


Fig. 19D

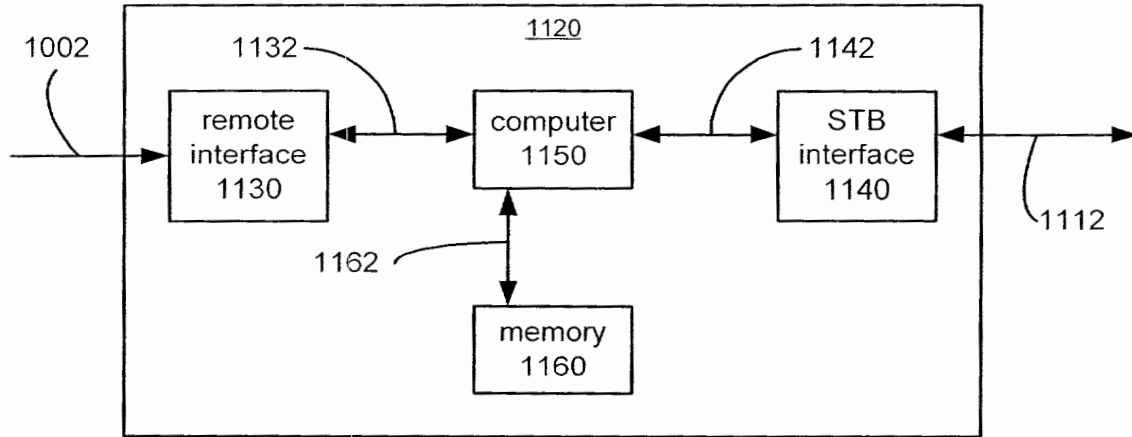


Fig. 20A

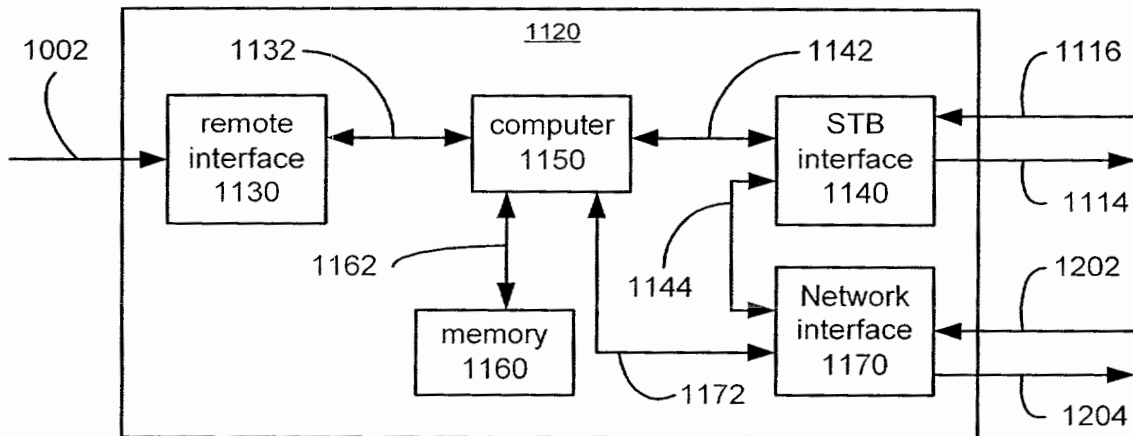


Fig. 20B

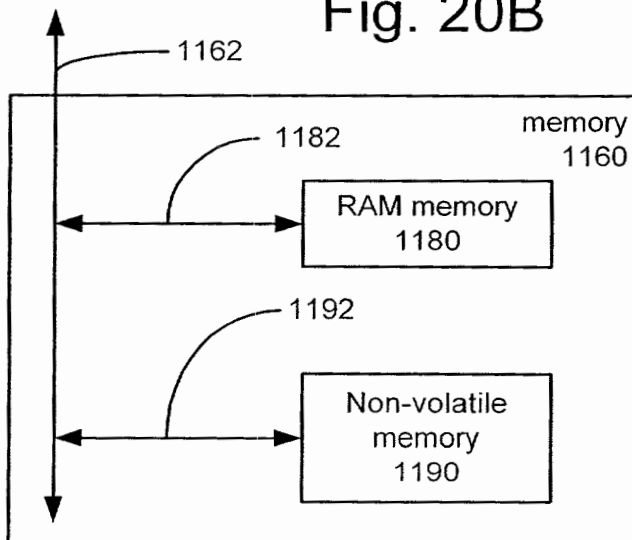


Fig. 20C

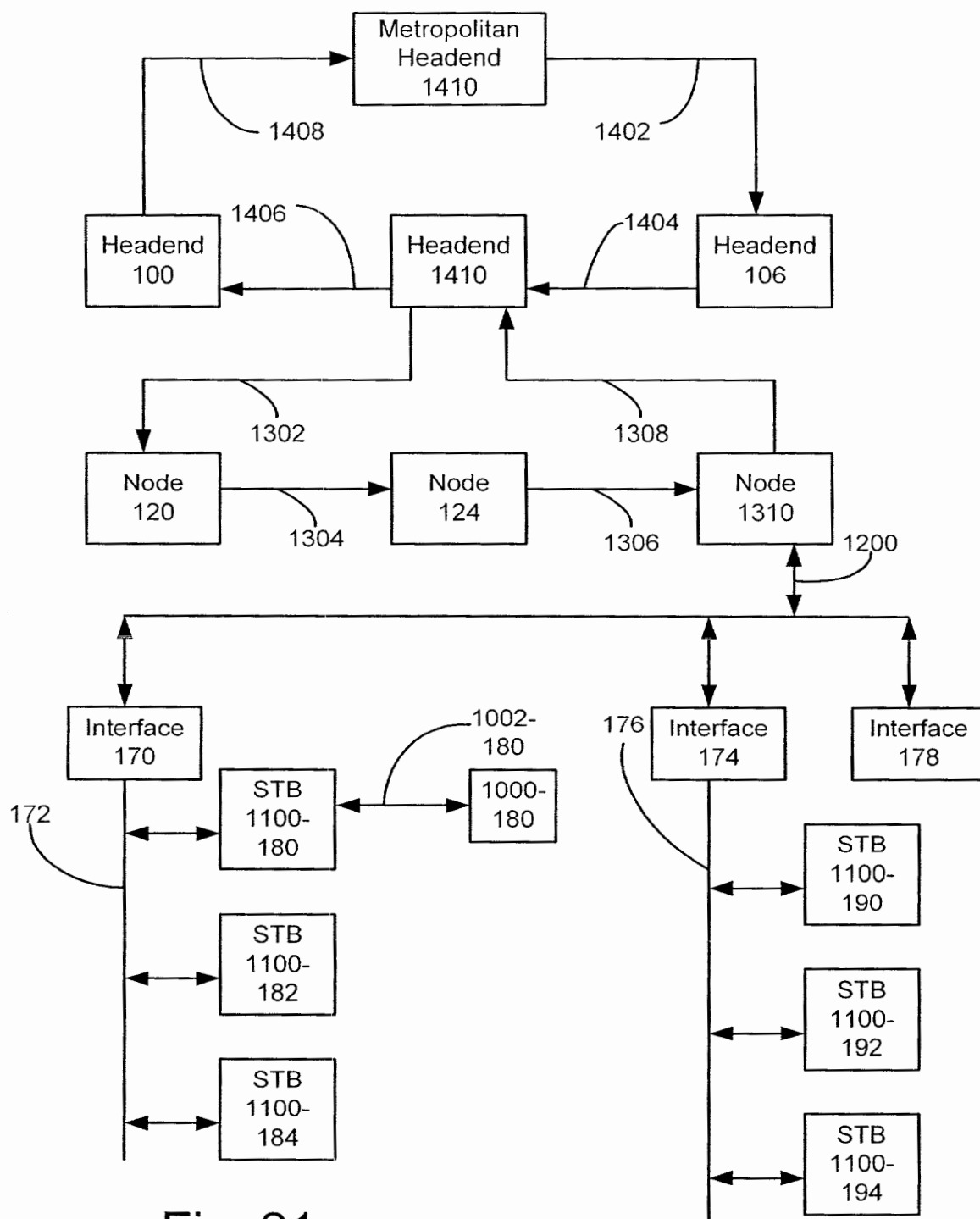


Fig. 21

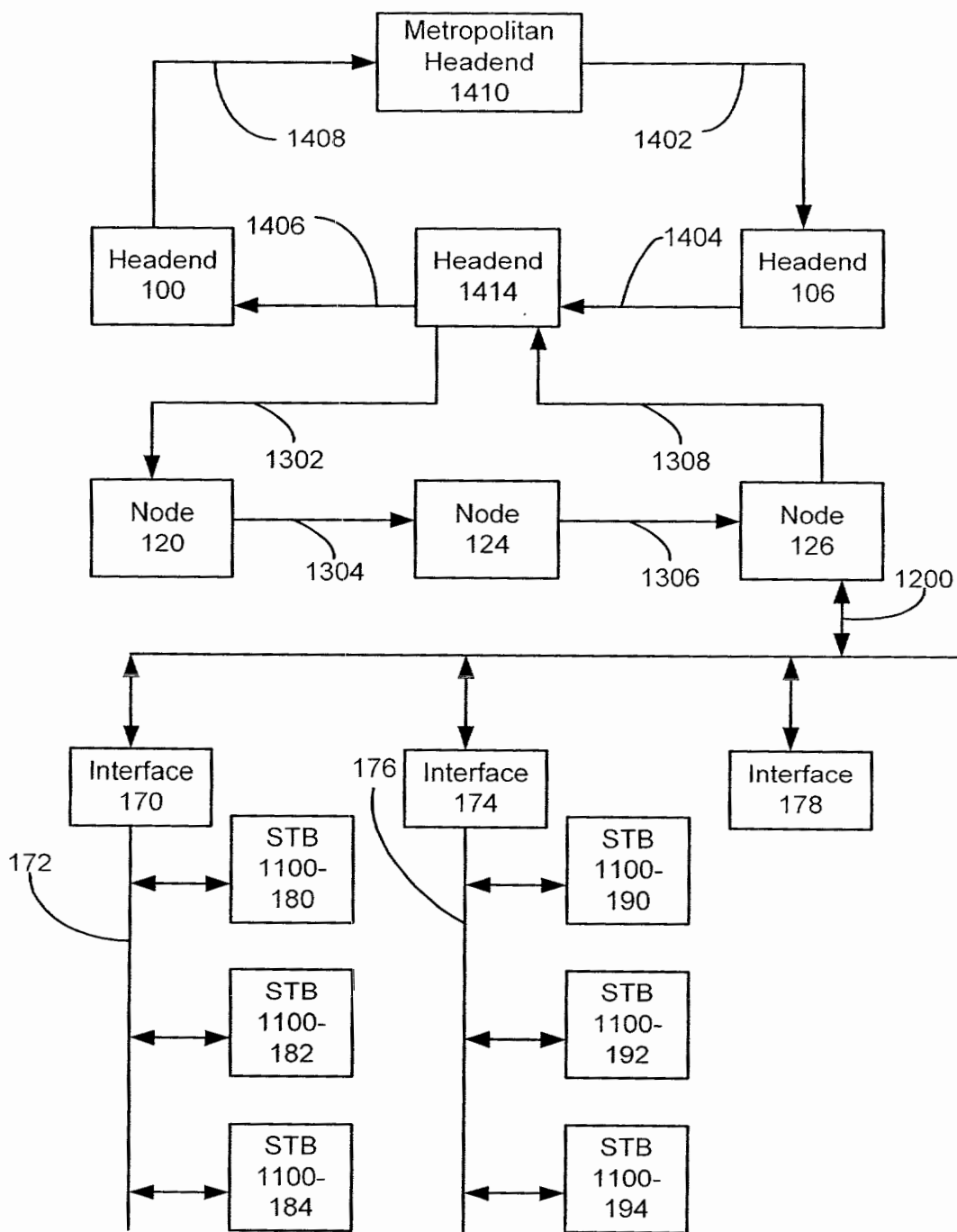


Fig. 22

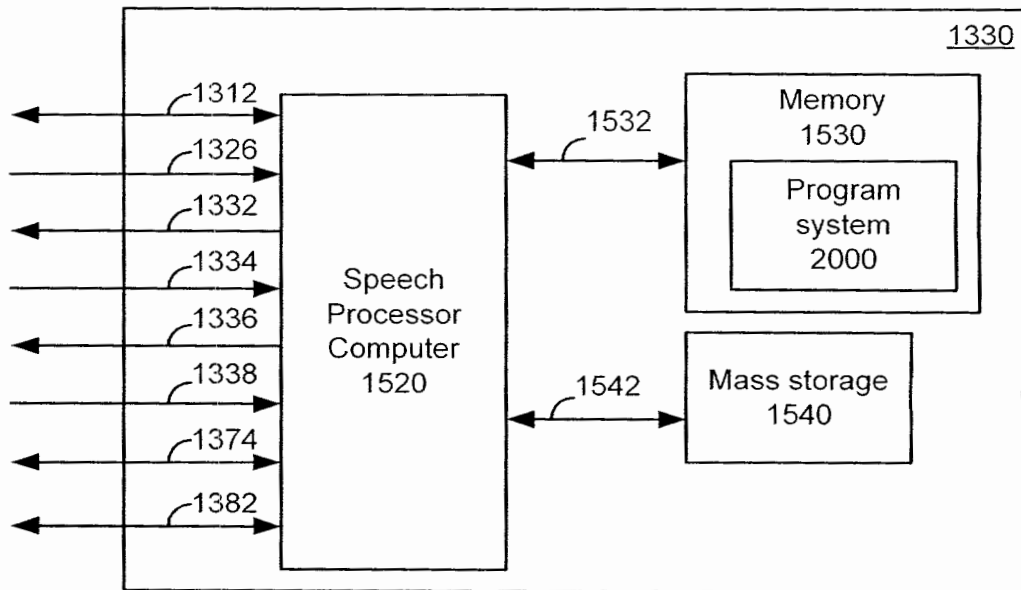


Fig. 28A

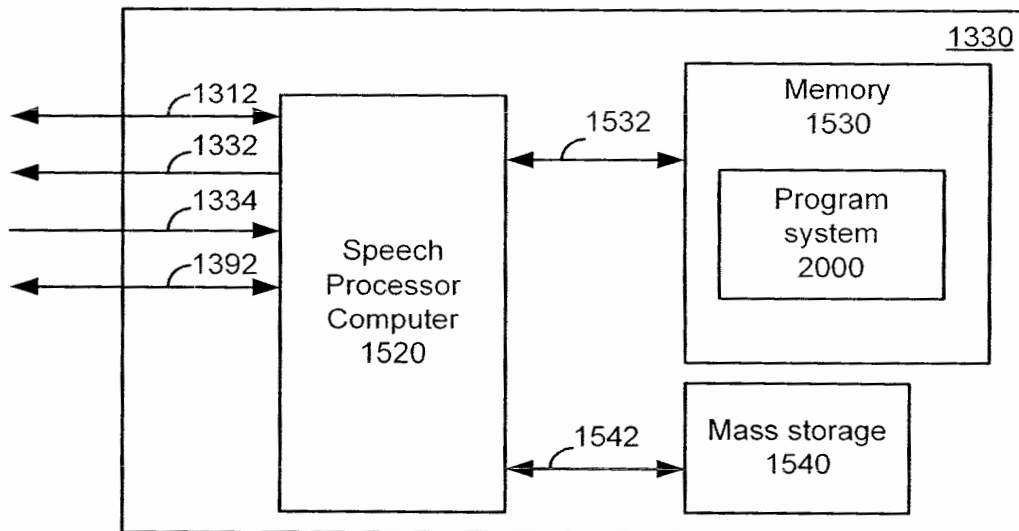


Fig. 28B

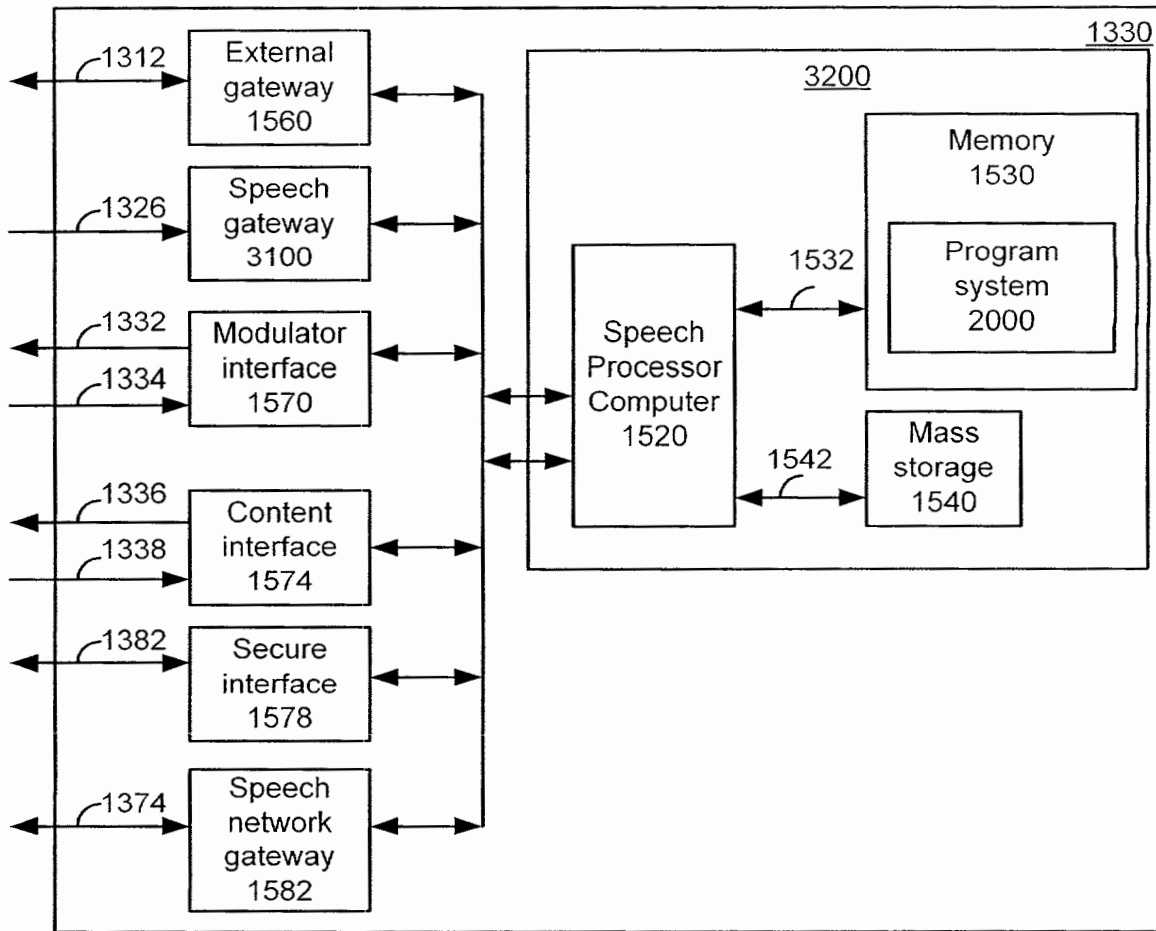


Fig. 29

[REDACTED]

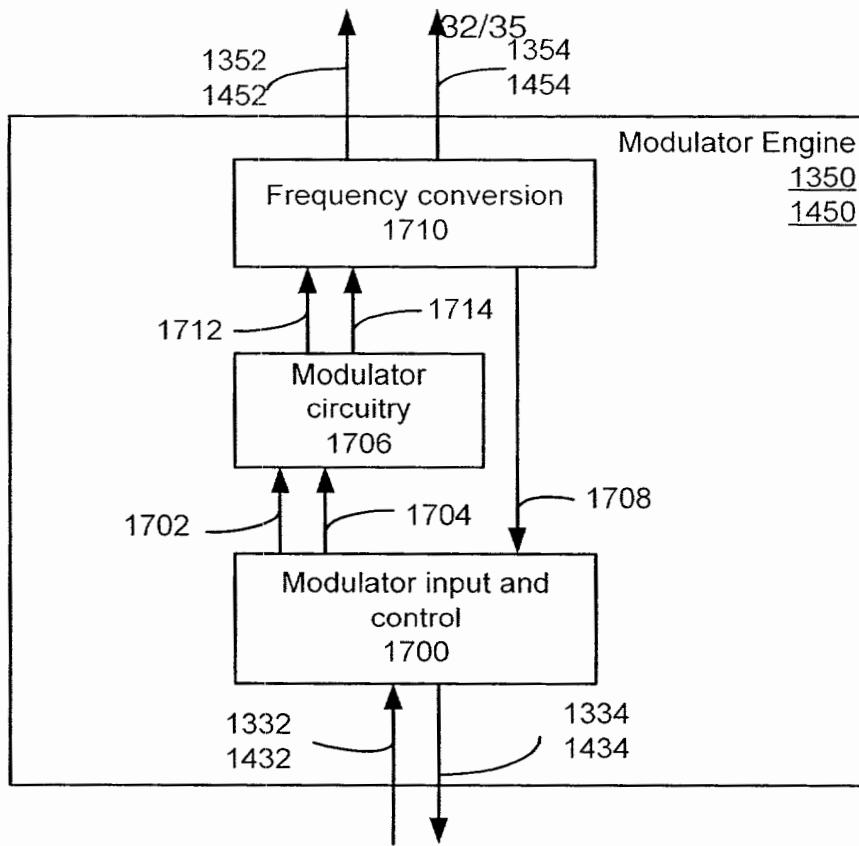


Fig. 32A

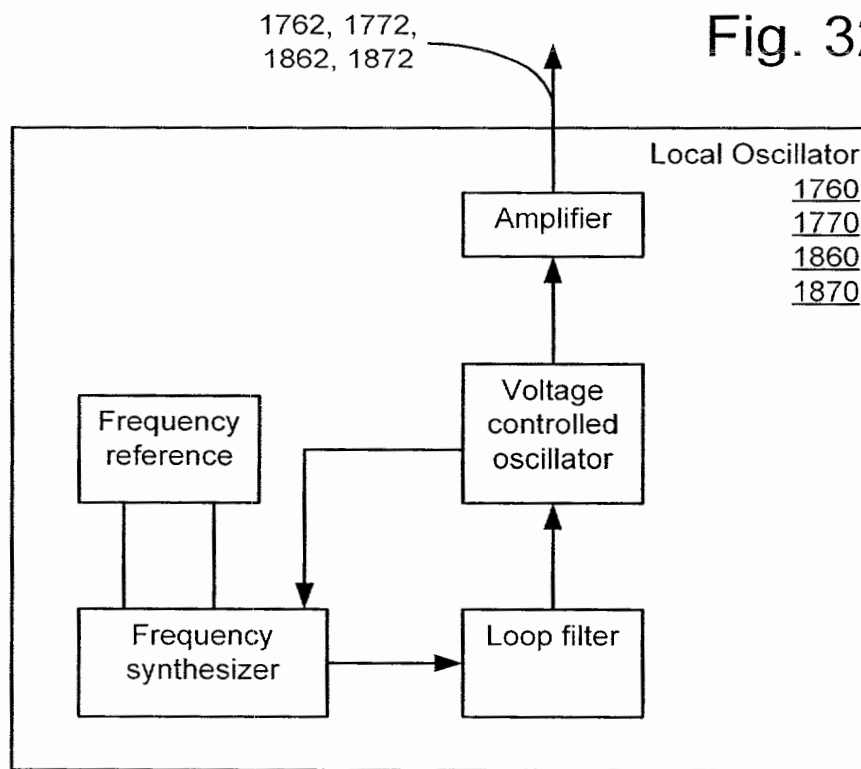


Fig. 32B Prior Art

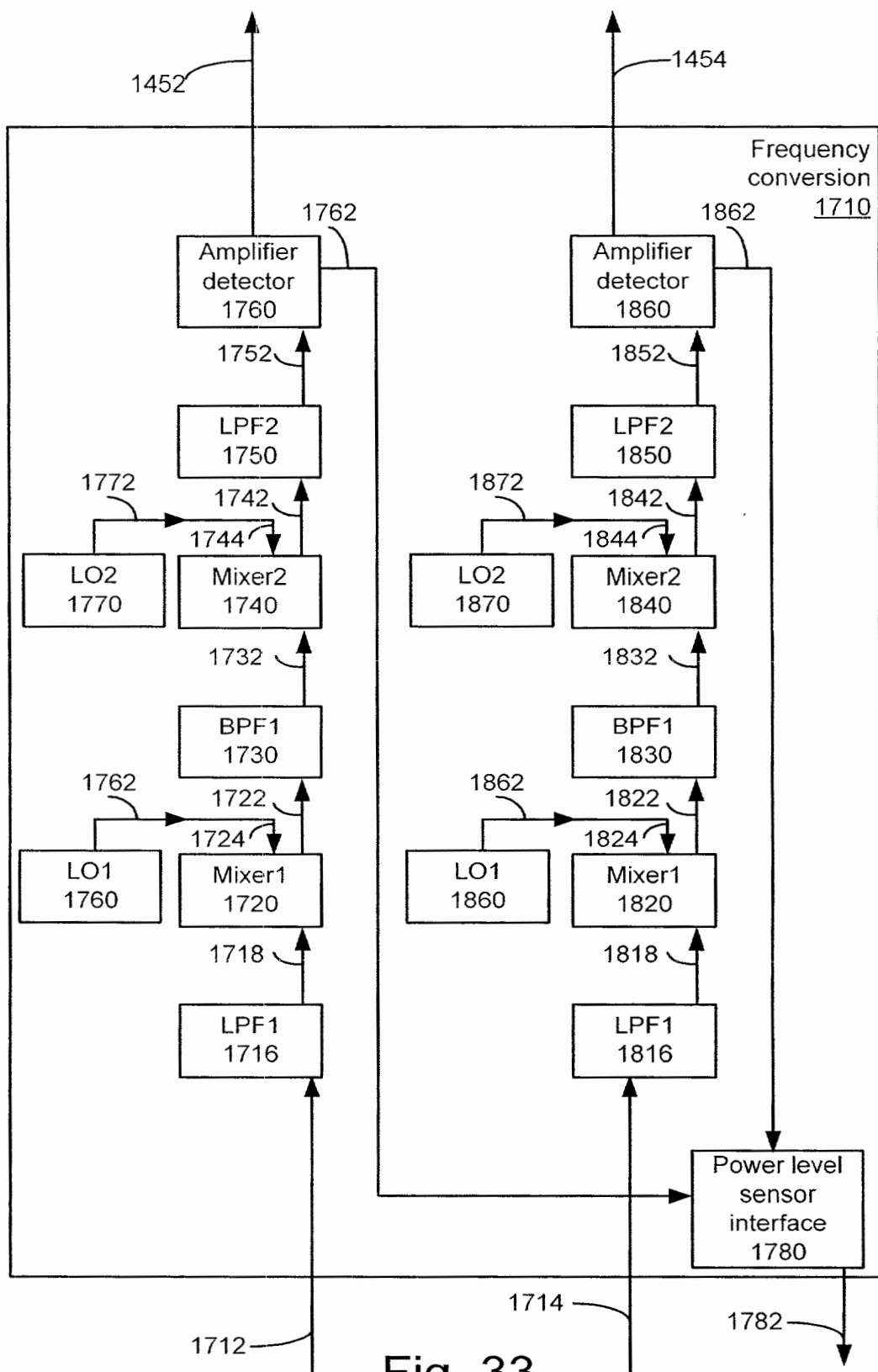


Fig. 33

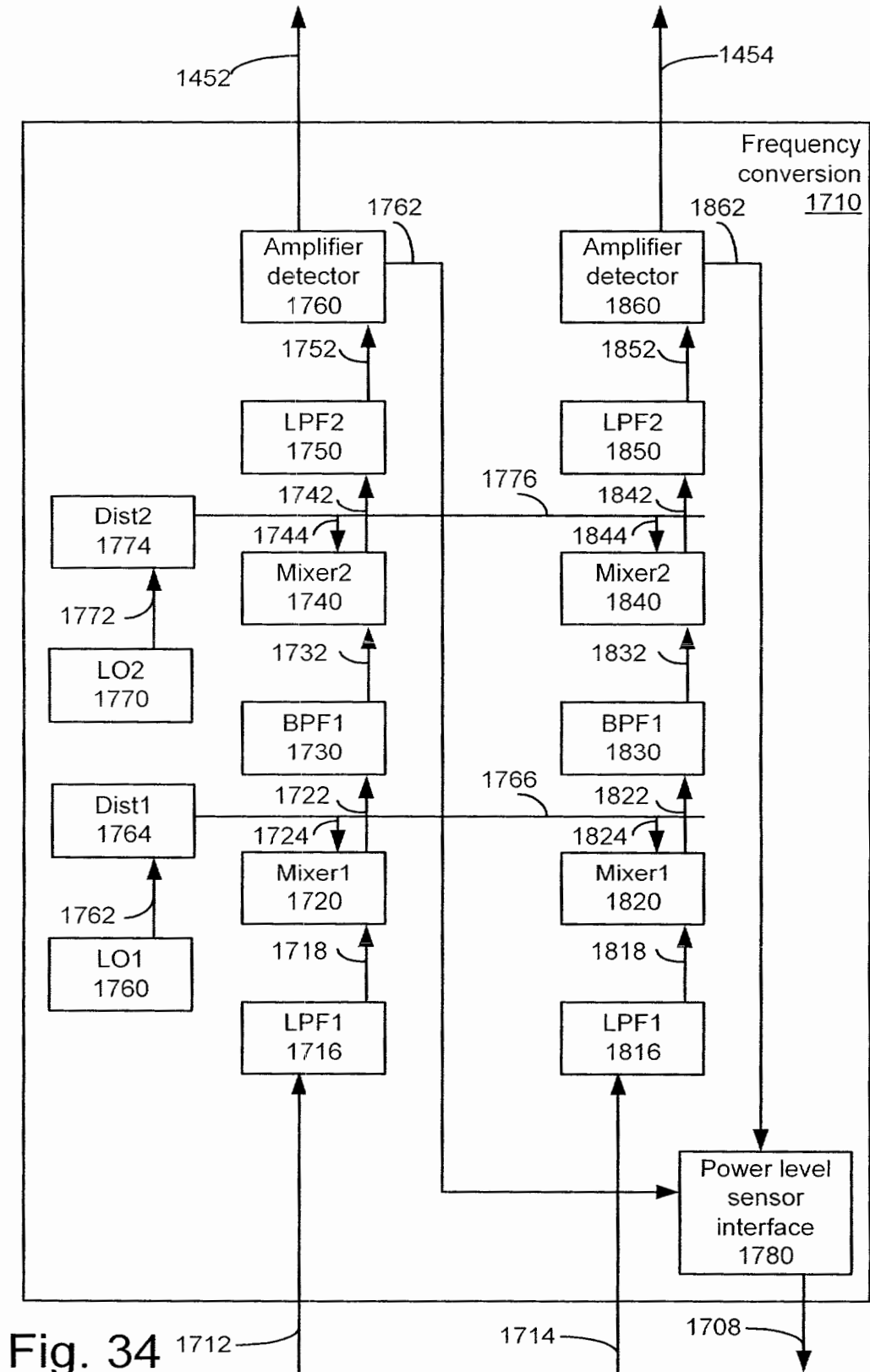


Fig. 34

TOP SECRET

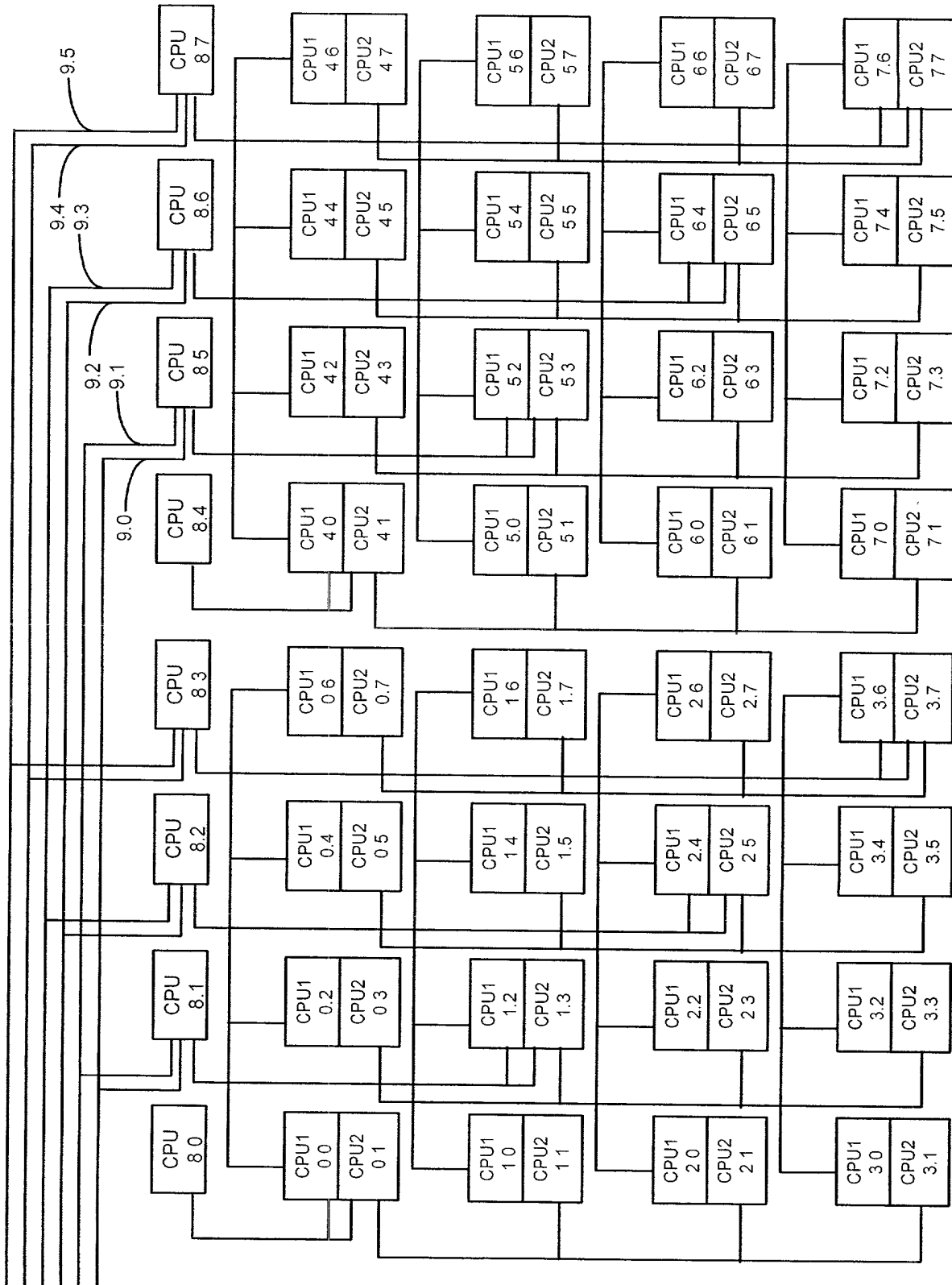


Fig. 35

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name;

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
NODE OF A NETWORK SUPPORTING CABLE TELEVISION
AND/OR VIDEO DELIVERY**

the specification of which (check one) X is attached hereto, or ____ was filed on _____
as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed

Yes

No

Number Country Day/Month/Year Filed

Number Country Day/Month/Year Filed

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

MICHAEL A. GLENN, Reg. No. 30,176

DONALD M. HENDRICKS, Reg. No. 40,355

KIRK WONG, Reg. No. 43,284

CHRISTOPHER PEIL, Reg. No. 45,005

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STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN

Docket Number (Optional)
AGLE0001

Applicant, Patentee, or Identifier: Calderone et al.

Application or Patent No.: Unassigned

Filed or Issued: Herewith

Title: System and Method of Voice Recognition Near a Wireline Node of a Network Supporting...

I hereby state that I am

- ☐ the owner of the small business concern identified below:
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN AgileTV Corporation

ADDRESS OF SMALL BUSINESS CONCERN 333 Ravenswood Avenue, Bldg. 202
Menlo Park, CA 94025

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office. Questions related to size standards for a small business concern may be directed to: Small Business Administration, Size Standards Staff, 409 Third Street, SW, Washington, DC 20416.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ☒ the specification filed herewith with title as listed above.
☐ the application identified above.
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e)

Each person, concern, or organization having any rights in the invention is listed below:

- ☐ no such person, concern, or organization exists.
☒ each such person, concern, or organization is listed below

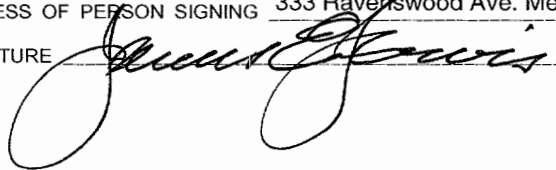
Separate statements are required from each named person/concern or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

NAME OF PERSON SIGNING James E. Jervis

TITLE OF PERSON IF OTHER THAN OWNER Vice President of Intellectual Property

ADDRESS OF PERSON SIGNING 333 Ravenswood Ave. Menlo Park, CA 94025

SIGNATURE  DATE 2-14-01

Burden Hour Statement This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO Assistant Commissioner for Patents, Washington, DC 20231.



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Bib Data Sheet

CONFIRMATION NO. 5055

SERIAL NUMBER 09/785,375	FILING DATE 02/16/2001 RULE	CLASS 704	GROUP ART UNIT 2644	ATTORNEY DOCKET NO. AGLE0001
APPLICANTS Theodore Calderone, San Carlos, CA; Paul M. Cook, Woodside, CA; Mark J. Foster, Palo Alto, CA;				
** CONTINUING DATA ***** THIS APPLN CLAIMS BENEFIT OF 60/210,440 06/08/2000 AND A CIP OF 09/679,115 10/04/2000 AND A CIP OF 09/664,874 09/19/2000 AND A CIP OF 09/661,486 09/14/2000 AND A CIP OF 09/708,315 11/07/2000				
** FOREIGN APPLICATIONS *****				
IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 04/04/2001			** SMALL ENTITY **	
Foreign Priority claimed ☐ yes ☐ no 35 USC 119 (a-d) conditions ☐ yes ☐ no ☐ Met after Allowance Verified and Acknowledged _____ Examiner's Signature _____ Initials _____		STATE OR COUNTRY CA	SHEETS DRAWING 35	TOTAL CLAIMS 66
				INDEPENDENT CLAIMS 4
ADDRESS 22862				
TITLE System and method of voice recognition near a wireline node of a network supporting cable television and/or video delivery				
FILING FEE RECEIVED 874	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit	

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

02/26/2001 JADD01 00000044 071445 09785375

01 FC:201	355.00 CH
02 FC:202	40.00 CH
03 FC:203	414.00 CH

PTO-1556
(5/87)

*U.S. GPO: 2000-468-987/39595

PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 2000

Application or Docket Number

7-666 0001

CLAIMS AS FILED - PART I

(Column 1)

(Column 2)

TOTAL CLAIMS	66	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	66 minus 20=	46
INDEPENDENT CLAIMS	4 minus 3=	1
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

SMALL ENTITY TYPE ☐

OR OTHER THAN SMALL ENTITY

RATE	FEE
BASIC FEE	355.00
X\$ 9=	414
X40=	40
+135=	-
TOTAL	809

RATE	FEE
BASIC FEE	710.00
X\$18=	
X80=	
+270=	
TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

(Column 1)

(Column 2)

(Column 3)

AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**
	Independent	*	Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

SMALL ENTITY

OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
X\$ 9=	
X40=	
+135=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X80=	
+270=	
TOTAL ADDIT. FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**
	Independent	*	Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE
X\$ 9=	
X40=	
+135=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X80=	
+270=	
TOTAL ADDIT. FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**
	Independent	*	Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE
X\$ 9=	
X40=	
+135=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X80=	
+270=	
TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET (FOR USE WITH FORM PTO-875)							SERIAL NO. 09785375		FILING DATE 02/16/01		
							APPLICANT(S)				
CLAIMS											
	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT			*		*	
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50							100				
TOTAL IND.	44						TOTAL IND.				
TOTAL DEP.	62						TOTAL DEP.				
TOTAL CLAIMS	66						TOTAL CLAIMS				

PTO-1260 (3-78)

*MAY BE USED FOR ADDITIONAL CLAIMS OR AMENDMENTS

U.S. DEPARTMENT of COMMERCE
Patent and Trademark Office

ARTIFACT SHEET

Enter artifact number below. Artifact number is application number + artifact type code (see list below) + sequential letter (A, B, C ...). The first artifact folder for an artifact type receives the letter A, the second B, etc..

Examples: 59123456PA, 59123456PB, 59123456ZA, 59123456ZB

09785375Z4

Indicate quantity of a single type of artifact received but not scanned. Create individual artifact folder/box and artifact number for each Artifact Type.

☐

CD(s) containing:

computer program listing

Doc Code: Computer

pages of specification

and/or sequence listing

and/or table

Doc Code: Artifact

content unspecified or combined

Doc Code: Artifact

☐

Artifact Type Code: P

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Artifact Type Code: S

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Artifact Type Code: U

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Stapled Set(s) Color Documents or B/W Photographs

Doc Code: Artifact Artifact Type Code: C

☐

Microfilm(s)

Doc Code: Artifact Artifact Type Code: F

☐

Video tape(s)

Doc Code: Artifact Artifact Type Code: V

☐

Model(s)

Doc Code: Artifact Artifact Type Code: M

☐

Bound Document(s)

Doc Code: Artifact Artifact Type Code: B

☐

Confidential Information Disclosure Statement or Other Documents marked Proprietary, Trade Secrets, Subject to Protective Order, Material Submitted under MPEP 724.02, etc.

Doc Code: Artifact Artifact Type Code X

☒

Other, description:

Floppy Disc
Doc Code: Artifact Artifact Type Code: Z

March 8, 2004



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Calderone et al.

Docket No.: AGLE0001

Serial No. : Unassigned

Art Unit: Unassigned

Filed: Herewith

Examiner: Unassigned

**Title: SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
 NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR
 VIDEO DELIVERY**

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

This Information Disclosure Statement is submitted:

- (X) under 37 CFR 1.97(b), or
 (within three months of filing national application; or date of entry of international application; or before
 mailing date of first office action on the merits; whichever occurs last)

- () under 37 CFR 1.97(c) together with either a:
 - () Certification under 37 CFR 1.97(e), or
 - () a \$220.00 fee under 37 CFR 1.17(p), or
 (After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs
 first)

- () under 37 CFR 1.97(d) together with a:
 - () Certification under 37 CFR 1.97(e), and
 - () a \$220.00 fee under 37 CFR 1.17(d)(2)(ii), and
 - () a \$130.00 petition fee set forth in 37 CFR 1.17(i)(1)
 (Filed after final action or notice of allowance, whichever occurs first, but before payment of the
 issue fee)

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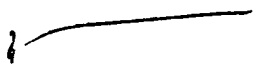
(X) The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 07-1445 (Order No. AGLE0001). A copy of this sheet is enclosed for accounting purposes.

(X) Applicant(s) submit herewith Form PTO 1449 -- Information Disclosure Citation together with copies of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.25.

() A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 156(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on form PTO 1449 and is enclosed herewith.

It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,



Michael Glenn
Attorney For Applicant
Reg. No. 30,176

Customer No. 22862

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Form 1449 (Modified) Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)	Atty Docket No.	Serial No.:
	AGLE0001	Unassigned
	Applicant:	
	Calderone et al.	
	Filing Date:	Group:
	Herewith	Not Assigned

J1017 U.S. PTO
 09/785375
 02/16/01

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	A	4,506,387	5/19/85	Walter	455	612	5/25/83
	B	4,633,499	12/30/86	Nishioka et al.	381	43	10/8/82
	C	4,757,541	7/12/88	Beadles	381	43	12/1/86
	D	4,827,520	5/2/89	Zeinstra	381	43	1/16/87
	E	4,847,885	7/11/89	Vittorelli	379	6	7/8/88
	F	4,991,217	2/5/91	Garrett et al.	381	43	11/30/84
	G	5,165,095	11/17/92	Borcherding	379	88	9/28/90
	H	5,199,062	5/30/93	Von Meister et al.	379	67	11/8/91
	I	5,231,670	7/27/93	Goldhar et al.	381	43	3/19/92
	J	5,247,347	9/21/93	Litteral et al.	358	85	9/27/91
	K	5,271,088	12/14/93	Bahler	395	2	4/7/93
	L	5,333,237	7/26/96	Stefanopoulos et al.	395	12	6/8/92
	M	5,335,276	8/2/94	Thompson et al.	380	21	12/16/92
	N	5,345,538	9/6/94	Narayannan et al.	395	2.84	1/27/92
	O	5,349,678	9/20/94	Morris et al.	395	800	8/21/91
	P	5,475,792	12/12/95	Stanford et al.	395	2.42	11/25/94
	Q	5,513,298	4/30/96	Stanford et al.	395	2.52	5/18/95
	R	5,585,858	12/17/96	Harper et al.	348	485	8/12/94
	S	5,608,448	3/4/97	Smoral et al.	348	7	4/10/95
	T	5,615,296	5/25/97	Stanford et al.	395	2.1	11/12/93
	U	5,664,061	9/2/97	Andreshal et al.	704	275	6/5/95
	V	5,671,328	9/23/97	Fitzpartick et al.	395	2.55	12/30/92
	W	5,726,984	3/10/98	Kubler et al.	370	349	10/5/95
	X	5,729,659	3/17/98	Potter	395	2.79	6/6/95
	Y	5,752,232	5/12/98	Basore et al.	704	275	11/14/94
	Z	5,752,246	5/12/98	Rogers et al.	707	10	6/7/95
	a	5,774,525	6/30/98	Kanevsky et al.	379	88	8/14/97
	b	5,774,859	6/30/98	Houser et al.	704	275	1/3/95
	c	5,774,860	6/30/98	Bayya et al.	704	275	10/30/96
	d	5,809,471	9/15/98	Brodsky	704	275	3/7/96
	e	5,819,225	10/6/98	Eastwood et al.	704	275	5/30/96
	f	5,832,439	11/3/98	Cox, Jr. et al.	704	275	12/14/95
	g	5,855,002	12/29/98	Armstrong	704	270	6/11/96
	h	5,860,059	1/12/99	Aust et al.	704	231	3/5/97
	i	5,864,815	1/26/99	Rozak et al.	704	275	7/31/95
	j	5,864,819	1/26/99	De Armas et al.	704	275	11/8/96
	k	5,867,817	2/2/99	Catallo et al.	704	255	8/19/96
	l	5,884,265	3/16/99	Squitteri et al.	704	275	3/27/97
	m	5,890,122	3/30/99	Van Kleeck et al.	704	275	2/8/93
	n	5,890,123	3/30/99	Brown et al.	704	275	6/5/95
	o	5,903,870	5/11/99	Kaufman	704	275	9/18/95
	p	5,920,841	7/6/99	Schottmuller et al.	704	275	6/25/97
	q	5,946,050	8/31/99	Wolff	348	553	10/4/96

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	r	5,960,399	9/28/99	Barclay et al.	704	270	12/24/97
	s	5,974,385	10/26/99	Ponting et al.	704	275	12/13/95
	t	6,012,030	1/4/00	French-St. George et al.	704	275	4/21/98
	u	6,035,267	3/7/00	Watanabe et al.	704	1	9/26/96
	v	6,035,275	3/7/00	Brode et al.	704	275	1/9/98

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
	w	Bruce Meyerson, <u>Vice Recognition Still Selective</u> , January 15, 2000, Yahoo! News Alerts
	x	<u>Where can I get an inVoca?</u> , http://invoca.com/home/htm
	y	<u>Integrated Audio-Graphics User Interface.</u> , April 1991, IBM Technical Disclosure Bulletin
	z	Stephanie Miles, <u>Will Microsoft's next OS run your TV?</u> , September 5, 2000, Yahoo! Daily News

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
09/785,375	02/16/2001	Calderone	AGLE0001

22862
GLENN PATENT GROUP
3475 EDISON WAY
SUITE L
MENLO PARK, CA 94025

CONFIRMATION NO. 5055

FORMALITIES LETTER



OC00000005940735

Date Mailed: 04/05/2001

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is unsigned.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.
- **The balance due by applicant is \$ 65.**

*A copy of this notice **MUST** be returned with the reply.*

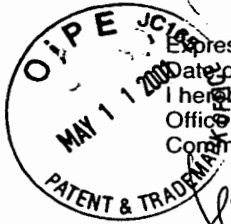
Customer Service Center

Initial Patent Examination Division (703) 308-1202

PART 3 - OFFICE COPY

06/14/2001 SSALEEKU 00000001 071445 09785375

01 FC:205 65.00 CH



05-14-01

Section 7

Express Mail mailing label no. EL556469487US

Date of Deposit: May 11, 2001

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D. C. 20231.

Jessica Pallach

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of)

Calderone et al.)

Serial No. 09/785,375)

Filed: February 16, 2001)

For: System and Method of Voice Recognition)

Near a Wireline Node of a Network Supporting)

Cable Television and/or Video Delivery)

Examiner: Unassigned

Art Unit: Unassigned

May 11, 2001

RESPONSE TO NOTICE TO FILE MISSING PARTS

Commissioner of Patents
and Trademarks
BOX MISSING PARTS
Washington, D.C. 20231

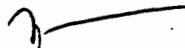
Sir:

In response to the Notice to File Missing Parts of Application--Filing Date Granted mailed April 5, 2001, enclosed herewith are the following:

- Copy of signed declaration previously filed 2/16/01;
- Copy of stamped postcard showing receipt by the Patent Office on 2/16/01;
- Copy of Missing Parts Notice; and
- Return Postcard

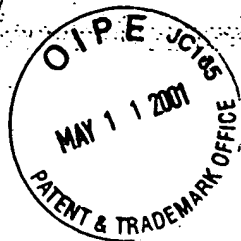
Since Applicant has shown proof that the original declaration was received in the Patent Office, Applicant believes there is no fee due. However, the Commissioner is authorized to charge any additional fees that may be due and credit any overpayments to Deposit Account No. 07-1445 (Order No. AGLE0001). A copy of this sheet is enclosed for accounting purposes.

Respectfully submitted,


Michael A. Glenn
Reg. No. 30,176

Customer No. 22862

Attorney Docket No. AGLE0001



Patent and Trademark Office (PTO) Acknowledgement

Please acknowledge the receipt of the enclosed documents, listed below, by imprinting the PTO date stamp in the space indicated and returning this postcard to the addressee indicated on the reverse.

Re: Application- Calderone et al. Ser. No. Unassigned

System and Method of Voice Recognition Near a Wireline Node... File No. AGLE0001

First Class Mail

Certificate of First Class Mailing

Date Mailed: February 16, 2001

Patent Application - Type Utility

Oath/Declaration/Power of Attorney

Assignments & Assignment Recordation

Patent Application Transmittal Form

Formal Drawings - no. of sheets 35

Informal Drawings - no. of sheets

Information Disclosure Statement

1449 Form

Cited References

Response (Amendment)

Preliminary amendment

Extension of Time - 1 Months

✓ Express Mail - Cert No. EL540887154US

✓ Certificate of Express Mailing

✓ Small Entity Statement - Business

Small Entity Statement - Independent

Copy of Missing Parts Notice

Response to Missing Parts Notice

Red-lined Fig. 1

Replacement Spec. Pages 21-68

Summary of Telephone Interview

Issue fee transmittal in duplicate-Copy

Transmittal Form

Other:

✓ Fee \$ 849.00

✓ Check No. Charge to MAG deposit account.





UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
09/785,375	02/16/2001	Calderone	AGLE0001

CONFIRMATION NO. 5055

FORMALITIES LETTER



OC000000005940735

22862
GLENN PATENT GROUP
3475 EDISON WAY
SUITE L
MENLO PARK, CA 94025

Date Mailed: 04/05/2001

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is unsigned.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.
- **The balance due by applicant is \$ 65.**

A copy of this notice MUST be returned with the reply.

Customer Service Center

Initial Patent Examination Division (703) 308-1202

PART 2 - COPY TO BE RETURNED WITH RESPONSE



COPY

#3

Patent Docket No. AGLE0001

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name;

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
NODE OF A NETWORK SUPPORTING CABLE TELEVISION
AND/OR VIDEO DELIVERY**

the specification of which (check one) ☒ is attached hereto, or ___ was filed on _____
as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

=====

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed
Yes No

Number Country Day/Month/Year Filed

Number Country Day/Month/Year Filed

=====

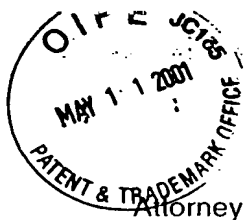
POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

MICHAEL A. GLENN, Reg. No. 30,176

DONALD M. HENDRICKS, Reg. No. 40,355

KIRK WONG, Reg. No. 43,284

CHRISTOPHER PEIL, Reg. No. 45,005



Attorney Docket No. AGLE0001

EARLE JENNINGS, Reg. No. 44,804

JACK J'MAEV, Reg. No. 45,669

SEND CORRESPONDANCE TO:

MICHAEL A. GLENN 3475 Edison Way, Suite L, Menlo Park, CA 94025

I hereby claim the benefit under Title 35, United States code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

<u>60/210,440</u>	<u>6/8/00</u>	<u>Provisional-PENDING</u>
Application Ser. No.	Filing Date	Status: Patented, Pending, Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: THEODORE CALDERONE

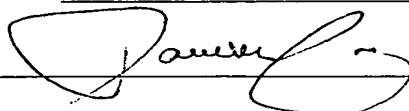
Inventor's signature  2/14/01
Date

Residence 422 Portofino Drive, #3, San Carlos, California 94070

Post Office Address Same

Citizenship United States of America

Full name second inventor: PAUL M. COOK

Inventor's signature  FEB. 14, 2001
Date

Residence 360 Old La Honda Road, Woodside, California 94062

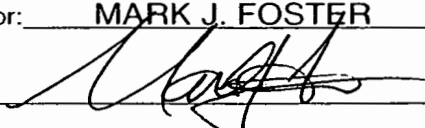
Post Office Address Same

Citizenship United States of America



Attorney Docket No. AGLE0001

Full name second inventor: MARK J. FOSTER

Inventor's signature  2/14/01
Date

Residence 4157 Interdale Way, Palo Alto, California 94306

Post Office Address Same

Citizenship United States of America



6AU 2644

I hereby certify that the transmittal of the below described document is being deposited with the United States Postal Service in an envelope bearing First Class Postage and addressed to the Commissioner of Patents and Trademarks, Washington, D.C., 20231, on the below date of deposit.			
Date of Deposit:	5/18/01	Name of Person Making the Deposit:	Antoinette Fabris
		Signature of the Person Making the Deposit:	Antoinette Fabris

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Calderone et al.

Serial No. : 09/785,375

Filed: February 16, 2001

**Title: SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR
VIDEO DELIVERY**

Docket No.: AGLE0001

Art Unit: 2644

Examiner: Unassigned

RECEIVED

MAY 23 2001

Technology Center 2600

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents

Washington, DC 20231

Sir:

This Information Disclosure Statement is submitted:

- ☒ (X) under 37 CFR 1.97(b), or
(within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- ☐ () under 37 CFR 1.97(c) together with either a:
 - ☐ () Certification under 37 CFR 1.97(e), or
 - ☐ () a \$220.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)
- ☐ () under 37 CFR 1.97(d) together with a:



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- ☐ Certification under 37 CFR 1.97(e), and
- ☐ a \$220.00 fee under 37 CFR 1.17(d)(2)(ii), and
- ☐ a \$130.00 petition fee set forth in 37 CFR 1.17(i)(1)

(Filed after final action or notice of allowance, whichever occurs first, but before payment of the issue fee)

(X) The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 07-1445 (Order No. AGLE0001). A copy of this sheet is enclosed for accounting purposes.

(X) Applicant(s) submit herewith Form PTO 1449 -- Information Disclosure Citation together with copies of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.25.

☐ A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 156(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on form PTO 1449 and is enclosed herewith.

It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,



Michael Glenn
Attorney For Applicant
Reg. No. 30,176

Customer No. 22862

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Form 2449 (Amended)	Atty Docket No. AGLE0001	Serial No.: 09/785,375
Information Disclosure Statement By Applicant	Applicant: Calderone et al.	
(Use Several Sheets if Necessary)	Filing Date: 2/16/01	Group: 2644

RECEIVED

MAY 23 2001

Technology Center 2600

U.S. Patent Documents

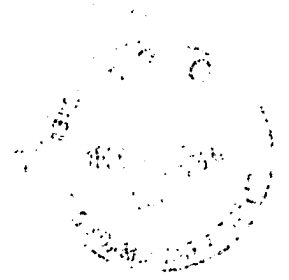
Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	A	Re. 32,012	10/22/85	Pirz et al.	381	43	3/10/80
	B	4,653,045	3/24/87	Stanley et al.	370	62	2/15/85
	C	4,780,906	12/25/88	Rajasekaran et al.	381	43	2/17/84
	D	4,783,809	11/8/88	Glinski	381	43	11/7/84
	E	4,797,910	1/10/89	Daudelin	379	67	5/7/86
	F	4,821,027	4/11/89	Mallory et al.	340	521	11/16/87
	G	4,907,079	3/6/90	Turner et al.	358	84	9/28/87
	H	4,931,950	6/5/90	Isle et al.	364	513	7/25/88
	I	4,959,855	9/25/90	Daudelin	379	213	7/25/88
	J	4,972,485	11/20/90	Dautrich et al.	381	43	5/23/89
	K	5,006,987	4/9/91	Harless	364	419	3/25/86
	L	5,125,024	7/23/92	Gokcen et al.	379	88	3/28/90
	M	5,127,003	6/30/92	Doll, Jr. et al.	370	110.1	2/11/91
	N	5,155,760	10/13/92	Johnson et al.	379	67	6/26/91
	O	5,163,083	11/10/92	Dowden et al.	379	88	10/12/90
	P	5,181,237	1/19/93	Dowden et al.	379	88	3/27/91
	Q	5,197,005	3/23/93	Shwartz et al.	364	419	5/1/89
	R	5,208,848	5/4/93	Pula	379	67	8/26/91
	S	5,255,305	10/19/93	Sattar	379	34	11/1/90
	T	5,274,560	12/28/93	LaRue	364	444	3/27/91
	U	5,325,421	6/28/94	Hou et al.	379	67	8/24/92
	V	5,329,608	7/12/94	Bocchieri et al.	395	2.52	8/18/93
	W	5,353,336	10/4/94	Hou et al.	379	67	8/24/92
	X	5,369,575	11/29/94	Lamberti et al.	364	419.08	5/15/92
	Y	5,386,556	1/31/95	Hedin et al.	395	600	12/23/92
	Z	5,434,777	7/18/95	Luciw	364	419.13	3/18/94
	a	5,442,749	8/15/95	Northcutt et al.	395	200.09	7/9/93
	b	5,500,920	3/19/96	Kupiec	395	2.79	9/30/94
	c	5,519,608	5/21/96	Kupiec	364	419.08	6/24/93
	d	5,526,034	6/11/96	Hoarty et al.	348	7	5/3/93
	e	5,550,578	8/27/96	Hoarty et al.	348	7	10/6/94
	f	5,553,119	9/3/96	McAllister et al.	379	67	7/7/94
	g	5,564,001	10/8/96	Lewis	395	154	6/24/94
	h	5,566,271	10/15/96	Tomitsuka et al.	395	2.84	4/18/94
	i	5,602,963	2/11/97	Bissonnette et al.	395	2.84	10/12/93
	i	5,608,624	3/4/97	Luciw	395	794	5/15/95
	k	5,625,814	4/29/97	Luciw	395	605	5/15/95
	l	5,634,086	5/27/97	Rtischev et al.	395	2.79	9/18/95
	m	5,642,519	6/24/97	Martin	395	759	4/29/94
	n	5,666,400	9/9/97	McAllister et al.	379	67	7/7/94
	o	5,668,929	9/16/97	Foster, Jr.	704	273	7/22/96
	p	5,671,225	9/23/97	Hooper et al.	370	468	9/1/95
	q	5,719,921	2/17/98	Vysotsky et al.	379	88	2/29/96



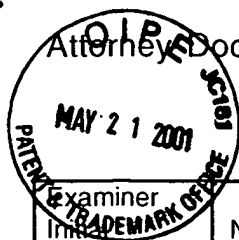
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	v	5,737,495	4/7/98	Adams et al.	395	615	9/29/95
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	y	5,748,974	5/5/98	Johnson	395	759	12/13/94
	z	5,774,841	6/30/98	Salazar et al.	704	225	9/20/95
	Aa	5,794,050	8/11/98	Dahlgren et al.	395	708	10/2/97
	Bb	5,794,205	8/11/98	Walters et al.	704	275	10/19/95
	Cc	5,802,526	9/1/98	Fawcett et al.	707	104	4/18/96
	Dd	5,802,526	9/1/98	Fawcett et al.	707	104	4/18/96
	Ee	5,805,775	9/8/98	Eberman et al.	395	12	2/2/96
	Ff	5,812,977	9/22/98	Douglas	704	275	8/13/96
	Gg	5,819,220	10/6/98	Sarukkai et al.	704	243	9/30/96
	Hh	5,821,508	10/13/9	Willard	235	51	12/24/96
	Ii	5,822,727	10/13/98	Garberg et al.	701	243	12/21/95
	Jj	5,826,267	10/20/98	McMillan	707	9	3/20/96
	Kk	5,832,063	11/3/98	Vysotsky et al.	379	88	8/1/97
	Ll	5,874,939	2/23/99	Galvin	345	156	12/10/96
	Mm	5,885,083	3/23/99	Ferrell	434	156	6/19/97
	Nn	5,892,813	4/6/99	Morin et al.	379	88.01	9/30/96
	Oo	5,893,063	4/6/99	Loats et al.	704	275	3/10/97
	Pp	5,915,001	6/22/99	Uppaluru	379	88.22	11/14/96
	Qq	5,917,891	6/29/99	Will	379	88.03	10/7/96
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	Ss	5,929,850	7/27/99	Broadwin et al.	345	327	7/1/96
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	Uu	5,933,835	8/3/99	Adams et al.	707	104	4/9/97
	Vv	5,937,041	8/10/99	Cardillo IV, et al.	379	93.25	3/10/97
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	Xx	5,963,940	10/5/99	Liddy et al.	707	5	8/14/96
	Yy	5,970,457	10/19/99	Brant et al.	704	275	8/30/96
	Zz	5,991,365	11/23/99	Pizano et al.	379	88.13	3/12/97
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	BB	5,999,970	12/7/99	Krisbergh et al.	709	217	4/10/96
	CC	6,003,072	12/14/99	Gerritsen et al.	709	218	6/30/94
	DD	6,009,398	12/28/99	Mueller et al.	704	275	4/18/97
	EE	6,009,470	12/28/99	Watkins	709	231	9/10/97
	FF	6,012,030	1/4/00	French-St. George et al.	704	275	4/21/98
	GG	6,018,711	1/25/00	French-St. George et al.	704	275	4/21/98
	HH	6,021,371	2/1/00	Fultz	701	200	4/16/97
	II	6,026,388	2/15/00	Liddy et al.	707	1	8/14/96
	JJ	6,026,388	2/15/00	Liddy et al.	707	1	8/14/96
	KK	6,034,678	3/7/00	Hoarty et al.	345	327	12/9/97
	LL	6,100,883	8/8/00	Hoarty	345	327	6/4/96



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	NN	98/26595	6/18/98	PCT	7	173		X

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
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	QQ	Robert Moore, Douglas Appelt, John Dowding, J. Mark Gawron, and Douglas Moran; <u>Combining Linguistic and Statistical Knowledge Sources in Natural-Language Processing for ATIS</u> ;
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	SS	John Dowding, Elizabeth Owen Bratt and Sharon Goldwater; <u>Interpreting Language in Context in CommandTalk</u> ; February 5, 1999
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	VV	Robert C. Bedichek; <u>The Meerkat Multicomputer: Tradeoffs in Multicomputer Architecture</u> ; Dissertation Given and University of Washington, 1994
	WW	James Karney; <u>A Sound Proposition Even Early on, There are Already Ways to Voice-enable a Site</u> ; January 15, 2001; Internet World
	XX	Sarah Roberts-Witt; <u>Talking to the Web</u> ; January 15, 2001; Internet World;
	YY	Hand out from SRI International; <u>Simple Ui to Retrieve Favorites</u>
	ZZ	Email dated January 15, 2001; Subject <u>Fwd: Large Linux Cluster</u>
	aa	Email: <u>Cray inc. Announces Plans for Alpha Linux Supercluster System</u> ; February 12, 2001
	bb	Email: <u>Fwd: Re: One Voice Technologies</u> ; February 15, 2001
	cc	Email: <u>Fwd: Re: One Voice Technologies</u> ; February 15, 2001
	dd	Email: <u>Fwd: Re: One Voice Technologies</u> ; February 15, 2001
	ee	Email: <u>Fwd: Ars Technica: Inside the KLAT2 Supercomputer - Page 1-</u>
	ff	53 Page printout from: http://www.ai.sri.com <u>CommandTalk</u>
	gg	Printout: http://WWW.SPEECH.SRI.COM/DEMOS/ATIS.HTML

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



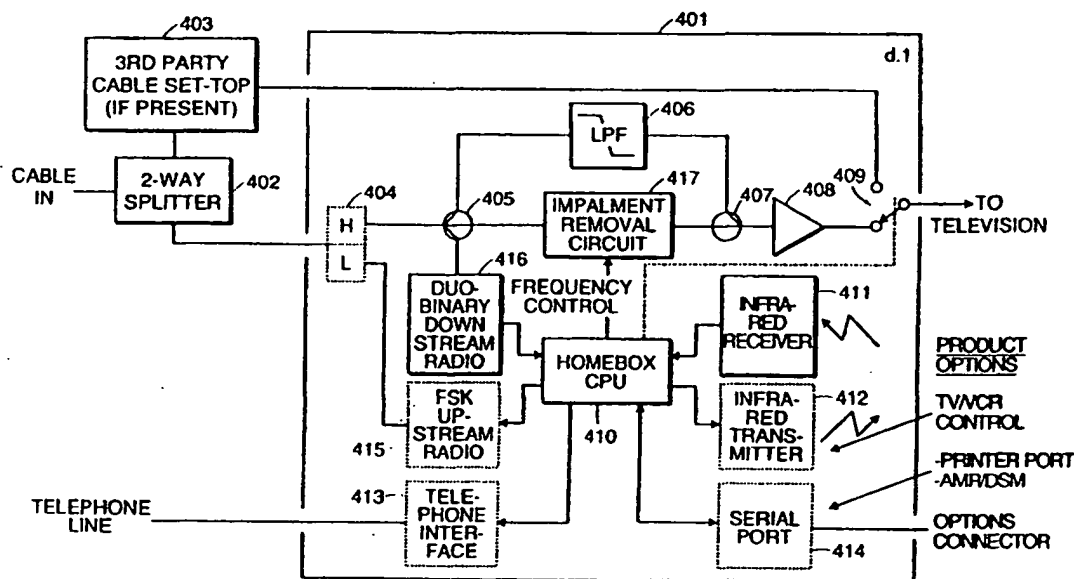
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(21) International Application Number: PCT/US98/25948 (22) International Filing Date: 7 December 1998 (07.12.98) (30) Priority Data: 60/067,990 9 December 1997 (09.12.97) US (71) Applicant: ICTV, INC. [US/US]; 14600 Winchester Boulevard, Los Gatos, CA 95030 (US). (72) Inventors: LAUDER, Gary, M.; 2 East 67th Street, New York, NY 10021 (US). HOARTY, W., Leo; 3465 Oak Hill Court, Morgan Hill, CA 95037 (US). (74) Agents: SUNSTEIN, Bruce, D. et al.; Bromberg and Sunstein LLP, 125 Summer Street, Boston, MA 02110 (US).	(81) Designated States: CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.	

(54) Title: VIRTUAL LAN PRINTING OVER INTERACTIVE CABLE TELEVISION SYSTEM



(57) Abstract

In an interactive television information system having a processor at a headend in communication with subscriber televisions through an information service distribution network, at least one printer is coupled to an interface controller connected to a data communication link. Each subscriber television is in communication access with a home interface controller. A selection input in a home interface controller permits a subscriber to request printing wherein a print command is generated in the home interface controller and sent to the processor at the headend. Information for printing is provided from the headend and transmitted over the data communication link to the interface controller coupled to a printer. The print command may include designation of which printer on the information service distribution network the printing information is to be sent to.

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VIRTUAL LAN PRINTING OVER INTERACTIVE CABLE TELEVISION SYSTEM

Field of Invention

This invention relates to cable television systems, particularly those permitting
5 users to print.

Background Art.

Bandwidth problems have long restricted the ability of cable television systems to provide private information services to subscribers. Such information services may include Internet access, video-on-demand, games, catalogs, etc. Private services may
10 also include allowing the user to select from among hundreds of less popular programming that is thus made available only on a demand basis. One solution to the limits on system bandwidth has been to assign a portion of cable system bandwidth to conventional or popular channels that are universally broadcast to all subscribers. The remaining available channels are then available for assignment to requesting subscribers
15 on a demand basis.

One such system for providing interactive services on a demand basis is described in U.S. Patent No. 5,550,578. The full disclosure of this reference is hereby incorporated by reference herein. Basically the cable service distribution network divides the subscriber pool into various service areas, each served by a different trunk.
20 A first group of channels broadcast to all service areas may provide conventional channels on channels 2 to 73 for example. A second group of channels, 74 to 79, for example, may be reserved for private information services. While the information on channels 2 to 73 is the same in each service area, the information on channels 74 to 79 is different in each service area. Of these channels, those that are in use are individually
25 assigned to requesting subscribers. Subscribers receiving analog signals will use a full channel, those receiving digital signals will share the assigned channel with other subscribers on a packet addressed or time shared basis. A subscriber in one service area may be interacting on channel 74 at the same time a different subscriber in a different service area was also assigned to channel 74. The headend is equipped with the
30 necessary processing, switching or splitting and combining systems for setting up these private channels on demand. Once assigned a channel for interactive services, the subscriber can request from any of a number of interactive services. Different interactive

services may be accessed by the user requesting a different channel. For example, channels 80 to 300 can be virtual channels each of which accesses a different interactive service. As the subscriber continues to change channels among the interactive alternatives, the program being watched will change but the subscriber will remain
5 tuned to the assigned channel for receiving interactive services. The information services can thus be provided to a subscriber over virtual channels in which the channel number changes for different interactive information services, even though the various information services may be provided over a fixed frequency input to the set-top. The control data from the subscriber's set-top can cause the back end to supply a different
10 information service as the subscriber appears to be changing the channel.

Interactive television systems benefit from giving a user an ability to print. U.S. Patent No. 5,014,125 (Pocock et al.) describes providing printers as a peripheral device or integral with a user terminal in an interactive system. Such a printer is controlled by a controller in the user terminal.

15

Summary of the Invention

The present invention is directed to printing through a cable television system. An interactive television information system has an information service distribution network which supplies a plurality of information and services from a headend to any of
20 a number of subscriber televisions. Each subscriber television has communication access to a home interface controller connected to the information service distribution network. This system includes at least one printer coupled to an interface controller connected to a data communication link. Print commands are received through the data communication link by the printer from a processor disposed in the headend of the
25 information service distribution network. A subscriber sends signals to a respective home interface controller such as print request signals. The print request signal causes the home interface controller to generate print command control data which is detected by the processor at the headend. The print command control data can provide an indication of which printer on the information service
30 distribution network should be used for printing. The processor at the headend may be one of a plurality of processors each of which gets assigned to one of the home interface

controllers when entering interactive mode. The data communication may be provided through the information service distribution network.

In the interactive television information system, television information signals are transmitted through the information service distribution network from the headend to subscriber televisions. A subscriber may cause control data to be sent to the headend with a print command. Information to be printed is sent from the headend through a data communication link to a printer on the network. The control data may select a printer so that the information signals are sent from the headend to the selected printer. The data communication link may be a separate link or may be found on the information service distribution network.

Brief Description of the Drawings

Fig. 1 is a block diagram of a headend for an embodiment of the present invention.

Fig. 2 is a block diagram of a back end for use in the headend of Fig. 1.

Fig. 3 is a block diagram of a front end for use in the headend of Fig. 1 with an exploded view of an analog user service module.

Fig. 4 is a block diagram of a front end for use in the headend of Fig. 1 with an exploded view of a digital user service module.

Fig. 5 is a block diagram of a frame server for use in the headend of Fig. 1.

Fig. 6 is a block diagram of a switching output RF hub for use with the headend of Fig. 1.

Fig. 7 is a block diagram of a home interface controller for use in connection with the headend of Fig. 1.

Figs. 8A-8F illustrate examples of subscriber television screen displays during an interactive session.

Fig. 9 illustrates a system diagram of a system manager for use in the headend of Fig. 1.

Fig. 10 is a flow diagram for a call set-up and tear down procedure for use by the system manager of Fig. 9.

Fig. 11 illustrates the frequency spectrum of the various signals used by a cable television system incorporating the headend of Fig. 1.

Fig. 12 is a high-level diagram of a home interface controller in communication with the back end.

Fig. 13 is a high-level diagram illustrating a cable return system.

Fig. 14. is a block diagram of an analog user service module with a frame
5 grabber.

Detailed Description of Specific Embodiments

For the purposes of the description herein and the claims that follow it, unless the context otherwise requires, the terms "cable television environment" and "cable
10 television system" include all integrated systems for delivery of any information service to subscribers for use in connection with their televisions. These include conventional cable television systems utilizing coaxial cable for distribution primarily of broadcast and paid television programming, cable television systems using fiber optics and mixed fiber optic-coaxial cable, as well as other means for distribution of information services
15 to subscribers. Similarly, unless the context otherwise requires, the term "information service" includes any service capable of being furnished to a television viewer having an interface permitting (but not necessarily requiring) interaction with a facility of the cable provider, including but not limited to an interactive information service, video on demand, Internet access, local origination service, community event service, regular
20 broadcast service, etc. "Television communication" means providing an information service via a television information signal. A "television information signal" is any signal that may be utilized by a television for video display, regardless of the form, including a standard NTSC-modulated rf carrier, an MPEG-compressed digital data stream, or any other format. "Interactive television service" means an information
25 service that utilizes an interface affording two-way communication with a facility of the cable provider. When a home interface controller is said to be in an "interactive mode," it means that the interactive television information system is providing an information service to the home interface controller. "Interactive pages" are defined herein to include still video frame images or a multimedia short script for interpretation by a local
30 process such as a typical page of HTML data as practiced by conventional web browsers. Thus the interactive page may show cursor movement or flashing or revolving images under local process control. An interactive page is typically sent intermittently from the

frame server. It does not require the frame server to continually send video information multiple times a second.

A cable television system comprises a headend and distribution plant. The cable distribution plant includes a cable distribution network having bridger amplifiers, feeders, feeder amplifiers, and cable drops serving homes.

Referring now to Fig. 1, a headend is illustrated for providing interactive services. The headend includes back end 11, front end 12, and switching output RF hub 13. Data communication from subscribers is delivered thru a return data link to the back end 11 of the headend. One alternative return link is through telephone lines to telephone return path processing block 101. Another alternative return link is through a reserved frequency band throughout the cable network. For example, the 5-40 MHZ band may be reserved for data communication from subscribers to the headend. Cable return path processing block 102 is in communication with such signals provided over a cable return path. Telephone return path processing 101 and cable return path processing 102 are connected through return path switches 103 with user service cards 202 and frame server 206.

Downstream data communication from the headend to the subscribers also takes place through a data communication link such as a telephone line or a frequency on the cable network. In the embodiment of Fig. 1, the downstream communication is carried out over the cable network at about 108 MHZ. System management CPUs 113, in addition to managing the processors in the headend, manage the downstream communications. A downstream data concentrator-spooler 115 collects the downstream communications and puts them in a queue for sending out over the downstream frequency. A data encoder 225 encodes the data using any suitable encoding method, such as frequency shift keying, QAM (quadrature amplitude modulation), or phase shift keying. The downstream data is modulated in the initial RF processing 310. Final modulation to the carrier frequency takes place in the final RF processing 315. The downstream data may be sent throughout the cable system as shown or additional final rf processing modules may be put in place to permit directing the data to one of several service areas. The system will be able to handle greater amounts of downstream traffic if the downstream frequency is reused for each service area.

The user service cards 202 each contain a processor that acts as an interactive controller which is individually assignable to a requesting subscriber on a demand basis. The interactive controller receives the data from its assigned subscriber and produces the information to be delivered to the subscriber in a television signal. The frame server 206
5 is one or more processors which interface with a plurality of subscribers. Processes running on the frame server 206 may be individually assigned to subscribers or may handle interactions with a plurality of requesting subscribers. Each interactive process on the frame server 206 responds to data from a subscriber and produces the information to be delivered to the subscriber in the form of a television signal.

10 The back end 11 further provides information sources to the front end 12. A network interface 104 is in communication with an Internet service provider. Back end switches 105 are in communication with the network interface 104 and web and application server CPU's 106 as well as system management CPUs 113. Communications are completed with the front end 12 through back end switches 105 via
15 distribution switches 201. Because the user service cards in a preferred embodiment are diskless and lack operating system software necessary for bootup, server 106 may also provide booting-up for the interactive controllers. Also, server 106 provides a web proxy server function so that information downloaded from a remote server on the Internet is quickly cached on server 106.

20 Distribution switches 201 provide communication signals and control signals to the user service cards 202, the frame server 206, MPEG to video decoder cards 208 and MPEG2 pass thru 209. MPEG and MPEG2 digital encoding schemes are referred to herein by example only. Those of ordinary skill in the art should readily recognize that the present invention may be practiced with other currently available and later developed
25 schemes for delivering video information through digital signals. The user service cards may be dedicated to any of a variety of interactive services. For example, there may be Internet service cards for running web browser processes and other video game player cards for running video game processes. The MPEG-to-video decoder cards 208 and the MPEG2 pass thru 209 are for providing video to subscribers on demand.

30 NTSC/PAL TV modulator cards 203 provide analog television signals from the outputs of the user service cards 202. The television signals are in the form of NTSC or PAL IF (intermediate frequency) signals. NTSC/PAL TV modulator cards 210 are also

provided for providing video on demand on analog signals. The analog signals from the user card chassis NTSC/PAL TV modulators 203 and the video on demand NTSC/PAL TV modulators 210 are provided to initial RF processing 301 and 303, respectively, in the switching output RF hub 13. The initial RF processing includes upconverting the

5 NTSC/PAL IF carrier signals onto a frequency determined by the channel frequency assigned to the subscriber destination. Channel assignment and control of any adjustable upconverters is handled by system management CPUs 113 which are in communication with the switching output RF hub 13 through communication lines not shown. In a presently preferred embodiment, a user service card 202, an NTSC/PAL modulator 203

10 and an upconverter may all be packaged in a single module. The module as a whole would be assigned to a requesting subscriber.

MPEG2 real time encoders 204 provide digital television signals from the outputs of the user service cards 202. The frame server 206 includes an MPEG encoder to provide digital television signals as well. Videos may be stored in MPEG2 format and

15 may therefor use pass thru 209 to directly provide digital television signals. The digital signals are combined into a composite 64QAM signal before going to initial RF processing. The digital signals are multiplexed so that many different signals may be carried on a single analog carrier. Multiplexer and 64QAM encoder 205 receives signals from the user chassis' MPEG2 real time encoders 204. Multiplexer and 64QAM

20 encoder 207 receives signals from the frame server 206. 64QAM encoder 211 handles the video signals from the video on demand chassis. Within switching output RF hub 13, initial RF processing 301, 302, 303 is performed in which there is one RF module per simultaneous user. The output of RF processing 301,302,303 is switched for delivery to the service area of each respective subscriber destination and all signals going

25 to a particular service area are combined via switcher-combiner 304. The combined signals for each service area pass through a final RF processing 305.

An embodiment of back end 11 is shown in more detail in Fig. 2. Cable return path processing 102 is provided by a bank of RF modems 102b. Splitters 102a extract cable signals for processing by the RF modems 102b. Telephone return path processing

30 101 is provided through the public service telephone network 101a to an integrated channel bank and modem 101b. Network interface 104 is provided by router firewall 105b and CSU/DSU (customer service unit/data service unit) 105a. Router firewall

105b is in communication with Ethernet switch 105c. Also shown in Fig. 2 are web proxy and application server 107, system manager 108, network manager 109 and commerce manager 110 in communication with Ethernet switch 105c. System manager 108 provides for the allocation of resources to permit interactive services with a user, as well as procedures for call set-up and tear down. Commerce manager 110 manages real-time transactions and converts billing to a batch format for handling by legacy systems. Also shown in Fig. 2 are operations console 111 and boot server 112 in communication with Ethernet switch 105c.

An embodiment of front end 12 is shown in Figs. 3 and 4. The user service cards are preferably each housed in a single user service module 212. Ethernet switches 201 are connected to the user service modules 212. The composition of the user service modules depend on whether they are to be used for analog or digital video signal processing. Arrangement of a preferred analog user service control module 212a is illustrated in Fig. 3. A return path interface 202e receives data signals from an assigned subscriber. A LAN interface 202f enables data communications between the user service card and the headend network accessed through the distribution data switches 201. This gives the user service card 202a access to various information sources and to the system management CPUs 113. The interactive controller is found preferably in a PC card 202a which is a personal computer on a single board. The NTSC/PAL TV modulator 203 includes a video display to NTSC/PAL converter 203a, a scrambler 203b and an RF modulator 203c. The scrambler 203b can be a complete conventional scrambler providing in addition to a scrambled television signal output, a signal authorization for data transmission to the assigned subscriber to allow descrambling at the subscriber's set-top. Alternatively and preferably, the scrambler 203b is a simplified scrambling unit that performs sync suppression to scramble the signal and is provided with a conditional access code (tag) for insertion into the scrambled signal. In such a system, a separate scrambler including an encrypter, an encoder and an access controller is provided in the front end 11 for each channel frequency. The access controller sends the signal authorization to each subscriber assigned to the channel frequency in any of the service areas. The signal authorization will typically include a key for decrypting the conditional access code. The encrypter encrypts the conditional access code. The encoder places the conditional access code into a scrambled reference video signal. An

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extractor in the separate scrambler for the given channel frequency removes the conditional access code from the reference and communicates it to each interactive control module active at the given channel frequency. The interactive control module provides a path for the conditional access code into the video scrambler 203b where it is
5 inserted into the scrambled signal. The conditional access code may be inserted into the vertical blanking interval (VBI) or the audio subcarrier depending upon the desired system design. The RF modulator 203c may include an IF signal that is modulated by the scrambled television signal to produce for example a 45MHz IF carrier for the scrambled television signal. It has also been found convenient to include the initial RF
10 processing 301 in the analog user service control module 212a. This involves including an RF upconverter for receiving the modulated IF carrier and raising the carrier to a frequency determined by the assigned channel frequency.

Fig. 4 illustrates a digital user service control module 212b. It can be seen that the digital user service control module 212b is similar to the analog user service control
15 module 212a as for the data input interfaces and the use of a PC card to act as the interactive controller. In the digital control module 212b, the information signal from the PC card 202a is provided to a video display to YUV converter 204a. The digital YUV output is encoded. The presently preferred encoder is an MPEG2 video encoder 204b and an associated MPEG2 audio encoder 204c. The encoded digital television
20 signal is input to a first stage of an MPEG2 multiplexer 204d. To the extent the cable system is also used to handle print requests from subscribers, printer output can be sent from the PC card 202a to the first stage of the MPEG2 multiplexer. The printer output would ultimately be directed through the cable system to a set-top and a printer connected to the set-top. The set-top may be a conventional interface controller with a
25 printer output and a television connection or it may be an interface controller devoted to interfacing the printer with the cable system. All outputs from the first stage MPEG2 multiplexers 204d are passed to the multiplexer and 64QAM encoder 205. This includes Ethernet Switch 205a, MPEG2 Re-Multiplexer 205b and 64QAM encoder 205c. The 64QAM encoder 205c produces a 45MHz IF signal which can then be upconverted in
30 initial RF processing 301.

A frame server 206 may be advantageously included in the headend. The frame server 206 is one or more computers for running numerous processes, each interacting

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with one or more assigned subscribers. Typically, it is expected that the frame server would be used for providing primarily interactive pages. The frame server will typically provide initial service to a requesting subscriber, for example, for logging on and establishing initial service. The frame server can also be effectively used to deliver E-mail messages, informational messages such as sports scores, transit schedules, weather, stock prices and other still frame oriented content. Other services can include Internet web browsing, catalog shopping, and electronic program guides. The inclusion of a frame server significantly reduces user demand for user service cards and thus holds down the overall cost of headend equipment. Rather than requiring a user service card for every subscriber that activates the interactive mode, the frame server allows many subscribers to receive interactive service without connection to a user service card. Indeed, the frame server is intended to provide an application source that is always available to respond to user interactions. Thus the system does not block but can always respond to an arbitrarily larger number of users albeit one frame at a time.

15 A subscriber interacts with a particular application within the frame server environment. The resulting outputs from the application are captured one display frame at a time and converted to the MPEG2, VPEP, TIFF, GIF, PDF or other suitable format. After conversion, the frame is transmitted to the user for MPEG2 or other decoding and display on the user's television set. The frame server uses one digital channel on a cable television or other broadband system. All subscribers accessing the frame server connect to the common channel. A frame of video representing the output of the software application with which the subscriber is interacting is uniquely addressed to that subscriber and transmitted over the common channel, much as all packet switched networks operate. Only the digital set-top terminal to which the frame of video is

20 addressed will decode the frame. It is expected that a subscriber interacting with a frame server application will receive requested interactive pages in less than two seconds from the subscriber's request.

Referring now to Fig. 5, the frame server 206 will be described in greater detail. The frame server system will typically operate as a collection of individual software processes that run on a single computer for small system use. The frame server can be

30 scaled to run on a networked cluster of computers acting in concert. The frame server 206 includes a plurality of information servers. These may include a web server 206b, a

mail server 206c, a news server 206d and a message server 206e. Each information server provides its own particular class of information. Locally generated messages are created by the message page generator 206f which provides those pages to the message server 206e. A cluster of message servers assist in the generation of pages of
5 information and cover various message types including in the presently preferred embodiment a customer service message server 206g, a help and error message server 206g' and a third-party message server 206g". The third-party message server encompasses such content as local advertiser messages.

Regardless of server source, the message pages (video frames) are presented by
10 the various respective servers to the user web browser 206h. All messages are created using HTML protocol so that regardless of source, the information is rendered via a web browser process 206h. The subscriber interacts with a web browser process via a return path processor 206q and request scheduler 206r. The return path processor receives user keyboard and pointer (mouse) commands from subscribers via the return path switch
15 103. The received user commands are processed by the return path processor 206q and passed to the request scheduler 206r for routing to the web browser process 206h handling a given user. The web browser establishes a state machine that tracks the user's inputs and generates requests to the appropriate server source.

Each active web browser process 206h renders an image in RAM from HTML
20 source received from a particular server. The rendered output is then passed to an RGB to YUV display driver 206j which converts the program generated display information from the standard RGB format to YUV which is the input format used by MPEG2 compression systems. This YUV rendered display frame is stored in a user virtual display memory 206k. A multiplexer, referred to herein as a user encoder queue
25 manager 206m, sequences the multiple user display pages through a FIFO to queue up for the MPEG2 I-frame encoder 206n for MPEG compression. The compressed signals are eventually transmitted to the respective subscriber via MPEG frame addressing 206p which provides addressing and system information appropriate to the digital set-top in use by the system. The resulting data stream, including various user display frames, is
30 routed into the switching output RF hub for distribution to the requesting subscribers.

An embodiment of switching output RF hub 13 is shown in Fig. 6. Initial RF processing is performed by RF up-converters 301, converting 45 MHZ input to an output

in the range of 150 to 300 MHz. The upconverters are preferably capable of modulating a carrier that is tunable under control of the system management CPUs 113, so that any given upconverter may be configured to best handle demands placed on the system. RF switch and combiner network 304 provides the upconverted signals to final RF

- 5 processing 305, which in Fig. 6 are indicated by block channel converters 305a and amplifiers 306. There is one block channel converter 305a for each service area. The interactive signals for delivery to a service area are combined with broadcast channels that are identically transmitted to all service areas. Fig. 6 illustrates this for one of the service areas where combiner 307 is shown. An optical transmitter 308 is used for
- 10 sending the combined signals out over optical fiber.

- Each subscriber of the system is equipped with a home interface controller 401 through which all interaction is conducted with the headend. Preferably, the home interface controller both receives the television signals from the cable and conducts data communication. However, the data communications could be handled by a separate box
- 15 connected to a phone line, if desired. A presently preferred home interface controller 401 is shown in Fig. 7. A cable carrying the television signals from the subscriber's service area is connected to a two-way splitter 402 which may also be connected to a cable set-top 403 provided by a third party. A duplex filter and combiner 404 provide a first frequency path to splitter 405 and a second frequency path to FSK (frequency shift-
- 20 key) radio 415, where the first frequency path occupies a higher spectral region than the second frequency path. The first frequency path provides a downstream path for signals going from front end 12 to the user of the home interface controller whereas the second frequency path provides an upstream path for signals going from the user to front end 12. An alternate upstream path may be provided through telephone lines via a telephone
- 25 interface 413.

- Splitter 405 provides a signal path to low pass filter 406 and an impairment removal circuit 417. The outputs of the low pass filter 406 and the impairment removal circuit 417 are re-combined at combiner 407, then amplified by amplifier 408. Switch
- 409 allows the user of the home interface controller 401 to switch between the signal
- 30 output of amplifier 408 and the output of the third party set-top 403 (if present). Switch 409 may also be under control of home box CPU 410.

Home box CPU 410 provides control and communication signals to impairment removal circuit 417, FSK upstream radio 415, telephone interface 413, serial port 414 and infrared transmitter 412. FSK upstream radio 415 is a modulator for providing a data communication link through a low frequency band on the cable between the home interface controller 401 and front end 12. Collectively, the upstream radio 415 and downstream radio 416 constitute the transmitter and receiver, respectively, of a data transceiver. In addition to or instead of the FSK upstream radio 415, telephone interface 413 can be used to provide communication over ordinary telephone lines to the front end 12. Infrared transmitter 412 may be used to communicate with the cable set-top 403 or the television. For example, when interactive mode is requested, the infrared transmitter can transmit the assigned frequency to the set-top or television tuning the appropriate appliance to receive the interactive television display. The frequency is learned by the CPU 410 through the downstream radio in communications from the headend. Infrared receiver 411 receives commands from a subscriber selection device. The subscriber selection device may be a typical television remote control or may include a keyboard, a mouse or other input device. The subscriber will have a channel selection input available for selecting a program on at least one of the available selection devices.

A serial port 414 and/or a parallel port may be advantageously included on the home interface controller to provide communication with a printer for hard copy printouts. The serial port 414 enables the subscriber to connect a printer to the home interface controller. Printers may thus be connected to a home interface controller used with a television. Alternatively, interface controllers lacking the connections to a subscriber television may be provided for interfacing a printer with a data communication link either through the television cable, a telephone line, a wireless link or other suitable data link for communicating printer data. When a subscriber is using the interactive system to browse the Internet, read E-mail, review advertisements or other still frame viewing, a print command can be used to obtain a printout of information. When the print command is received by an assigned interactive controller at the headend such as in digital control module 212b, a frame grabber in the assigned interactive controller can save the television screen and transfer it to an interactive controller assigned to the printer. The television screen may then be converted to printer output which is transmitted to the interface controller for the printer. Instead of printing the

current television screen. a print command may ask for printing of specific material such as a coupon or a web page. Whatever the printer output, the interactive controller assigned to the printer transmits it to the interface controller for the printer. The interface controller passes along the printer output through the serial or parallel port to
5 the attached printer.

It is contemplated that households having printers, generally have them attached to their home computer. Such persons may be unwilling to purchase an additional printer for their interactive television system or to move their printer from the computer to the television. The interactive system described herein may be used to create a virtual
10 local area network. An additional interface controller may be installed in the home for connection to the printer. The television cable into the home may be connected to this interface controller in addition to connection with the home interface controller of the television. A subscriber operating in interactive mode and viewing a television screen may activate a print command by clicking a mouse with a cursor on the screen over a
15 print icon, by simply keying in a print command or other input method. The application at the headend communicating with the subscriber will need to know from the subscriber to which interface controller the print output should be sent. The destination for print output can be pre-entered as a default, set up early in an interactive session or entered when printing is desired. When the print command and destination are received at the
20 headend, the printer output from the application can be addressed to the destination interface controller. An information signal with the destination interface controller may be sent to system management. A print program can run on an interactive controller assigned by system management to the destination interface controller. The printer output is transmitted to the destination interface controller for printing. Meanwhile, the
25 requesting home interface controller can continue to interact with its assigned interactive controller. In accordance with this method of operation, the destination interface controller can be anywhere on the cable distribution network, or indeed, anywhere on the data communication link. Thus a user can cause a printout at an office printer, a relative's printer or indeed any printer the user can identify. For the user at home,
30 printing through a printer at home it may seem that the print command is delivered directly to the printer in another room. In reality, the print command will travel up to the headend causing the headend to deliver the print output down through the data

communication link, which may be through the cable, to the designated interface controller with an attached printer. The interface controller will need to always be listening to a data communication link or to the frame server common channel so as to recognize and receive information addressed to itself. Printing may be effectuated
5 through a data communication link along the cable television distribution network or through a separate link such as a telephone line or wireless link.

When a user of the home interface controller requests an interactive service from head end 12, such as Internet service or a video game, an appropriate frame server application or user service module is placed in use for providing the service to the user.

10 The user selects the desired service by using the subscriber selection device in conjunction with the home interface controller. Examples of screen displays available to the user for selection of a service are illustrated in Figs. 8A-8F. Fig. 8A shows a beginning display, in which front end 12 requests appropriate information from the user, including a PIN code number. In this way, for example, children may be blocked from
15 requesting unsuitable video content. Once the back end 11 identifies the user (this will be discussed in more detail later), various options are available, as shown in Fig. 8B. Fig. 8C shows a screen in which the "news" option of Fig. 8B has been chosen. In Fig. 8C, once the user has decided to choose a news program, the user may decide to choose CNN or MSNBC. Fig. 8D shows the screen when the user has selected the CNN option
20 of Fig. 8C. Fig. 8E is similar to Fig. 8B, except that this screen appears when the "Junior" button and appropriate PIN code is entered in Fig. 8A. Fig. 8E shows the screen that results when the "games" button in Fig. 8E is entered. It should be noted that the interaction here is via an Internet-type browser, which permits not merely surfing the Internet, but actually selecting different information services using hyperlinks.

25 Fig. 9 illustrates a system diagram for system manager 108, indicating the two functions of (1) call set-up and tear down and (2) resource allocation with the interactive TV system of Fig. 1. Call set-up is the process of causing the assignment of a television information signal path to the home interface controller for interactive service, and resource allocation is the process of assigning appropriate user service cards and virtual
30 circuits within the switching system in the back end.

Call set-up is initiated by a small program in the home interface controller which keeps track of the channel the user is watching. The channels are broken into bands

where, for instance, channels 2 through 73 are assigned regular TV programming both off-air TV channels as well as cable channels such as MTV, HBO, CNN, etc. The band above this broadcast band uses channels 74 to 79, for instance, for interactive services where a user is assigned one of these channels only during the duration of that user's

5 interaction with the interactive TV system (i.e. - while looking up a restaurant in the entertainment guide, or while watching a movie, etc.). A user may tune from a broadcast channel (e.g. - ch. 37 CNN) to an interactive service virtual channel, at which time the user will be provided with the screen displays of the type shown, for example, in Figs. 8A through 8F. When the user selects interactive service, the small program in the home

10 interface controller sends a signal to the system manager at the back end to initiate call set-up.

The system manager in back end 11 begins the call set-up process through a system manager subsystem called the call setup server (CSS) 80. The CSS 80 finds a free interactive element or selection element corresponding to the virtual channel number

15 the user is trying to tune to. As an example, assume the user is interested in movie previews which are viewed through interacting with a user service card and a program run on service "A" application process 811. The CSS 80 will call a video path manager subroutine to check for an available television information channel within the band of television information signals allocated to provide interactive service to the

20 neighborhood of the requesting user. The newly assigned television information signal of the requesting user and the user's network address is passed to a service allocation server (SAS) 81 associated with the application process.

Assuming a non-blocked call, the system management function has now passed from the CSS 80 sub-system to the SAS 81 (for this example). The CSS 80 is now out of

25 the loop. The SAS 81 checks for a free resource, i.e., a processor for running a service application process. If one is available, control is passed to it along with the assigned television information signal and address of the calling user. The processor, in this example, is a user service PC card 202a. The service application process run by the PC card 202a sends a request to the application support server 87 for subscriber information

30 to authenticate the user id for the neighborhood from which the signal is originating. The service application process also requests subscriber information from the application support server 87 customer database to check for paid-up service and/or access to service

permission (e.g. - used to block children from viewing R rated movie previews. for one example). Upon success, the service application process directs the conditional access controller (CAC) 86 to send a descramble key code to the user's set-top converter to allow it to descramble the video signal that the service application process will be using.

- 5 The service application process also communicates directly with the in-home operations process (IHOP) 85 running in the home interface controller CPU 410, informing the program of the assigned television information signal. A separate processor in the set-top receives the descrambling authorization keys and translates them.

- The set-top IHOP 85, upon receiving the assigned channel, tunes the cable TV
- 10 set-top to the assigned channel. The user will see the output of the SAP 811 and can begin using the remote control to manipulate the program running on the SAP 811. The in-home operation process 85 transmits appropriate remote control commands addressed to the processor/process assigned to it. When the user tunes to a broadcast TV channel, the call take down process is initiated by the set-top system manager extension signaling
- 15 the 811 that the user has tuned away, and, after a time-out period (for instance, five minutes), the 811 signals the call set-up server 80 to release the interactive virtual channel previously assigned. The virtual channel is logged back into the free channels list by the CSS 80. At the same time, the SAP 811 signals the SAS 81 that it is now a free resource and the SAS places the user service card that had provided the application
- 20 process on its free card list.

- The example above is the same for other kinds of user service cards for interactive multimedia, such as video game player cards, and MPEG-to-video decoder cards 208. A user service card can be used for a front end application such as movie previewing and purchasing. When the user picks a movie using a user service card, the
- 25 user service card will then pass control of the user to a control program that manages movie playback and decompression (MPEG2 to NTSC). When the movie is over, the movie playback control program follows the same steps of call take down as the user service card did.

- The above system management scheme can accommodate any number of diverse
- 30 services in a fully distributed manner such that there are no bottlenecks in the system. This affords optimal performance in response to user requests. By distributing the processing of communications with home interface controllers throughout system

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management, a greater amount of processing can be conducted in less time with less expensive processing units.

System management may include separate service allocation servers 81 or 82 for each of the video on demand system, the digital user service cards and the analog user service cards. Moreover, there may be additional service allocation servers further dividing the user service cards into groups according to the type of interactive service provided. Thus, there may be a service allocation server for movies only, for games, and for catalogs. The service allocation servers act as intermediaries between the call set-up server and the video provider elements whether they be analog user service cards, digital user service cards, frame server web browser applications 206h or MPEG-to-video decoder cards 208. The service allocation servers provide distributed management. The call set-up server 80 can pass the call set-up to the appropriate service allocation server. As the service allocation server identifies a video provider element and completes the connection with the home interface controller, the call set up server can be attending to the next caller.

The communications gateway 83 acts as a translator between the IHOP 85 and the back end 11 LAN connecting the distributed processes of the system manager. The communications gateway 83 translates the IHOP address from an individual user into a global Internet Protocol (IP) address for addressing Ethernet data packets within the back end LAN. IP is part of TCP/IP. Communications are directed from the communications gateway 83 to the application process directly. Once the service allocation server assigned to a home interface controller has put the home interface controller in communication with the requested application process, the communications can be handled directly. System management is also required to maintain administrative tasks such as billing. Each of the service application processes is in communication with a transaction interface process so that billing and credit and other financial matters can be taken care of.

Fig. 10 illustrates a flow diagram for a call set-up and tear down procedure as shown in Fig. 9. In Fig. 10, step 91 indicates that a request for an interactive service from a home interface controller is made on a hailing frequency. The hailing frequency need only occupy a relatively small bandwidth at a relatively low carrier frequency (compared to ordinary television signals). In step 92, the gateway receives the request from the user

and transmits a private frequency (approximately 25 kHz bandwidth) assignment to the home interface controller to be used for upstream data. Instead of a private frequency, the gateway may transmit the frame server common channel or this channel may be a default initial channel without need for notification. In step 93, the gateway also converts the private address to an IP address, as discussed in relation to Fig. 9. In step 95, the system manager hands off to the call set-up server, and in step 951, the call set-up server hands off to the service A (for example) allocation server. In step 952, the service allocation server hands off to the video path manager to identify an open TV channel to assign to the home interface controller. In step 953, the video path manager hands off to service A application process to identify an available user service card to run service process A and to assign to the home interface controller requesting the requested service. In step 954, the assigned user service card provides an interactive menu and, if selected, Internet Web service is provided via an application support server (proxy server). Step 96 indicates that a newly requested service is handled by service A allocation server. If a new service is requested, then in step 97 the service A allocation server hands off to the call set-up server, and in step 98 the call set-up server hands off to the appropriate service allocation server. Step 99 indicates that additional processing maybe necessary, depending upon the requested service (as discussed in relation to Fig. 9). Application processing is terminated in step 991 when the interactive service is completed. whereupon in step 992 the assigned TV channel is returned to the pool of available channels to the video path manager. Also, upon completion of the interactive service, the assigned user service card is also made available to the pool of available service application processors. In step 994, the assigned frequency is returned to the pool of available frequency assignments so that the gateway can re-use the frequency for upstream data from another home interface controller.

Further details regarding system management and the use of service allocation servers therein can be found in PCT Application No. WO 98/26595 published June 18, 1998, entitled "System Manager and Hypertext Control Interface for Interactive Cable Television System." The full disclosure of said PCT application is hereby incorporated by reference herein.

Fig. 11 indicates the frequency spectrum of the various signals used by the television system. The spectrum to the left of the left-to-right arrow in Fig. 11 indicates

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upstream data, whereas the spectrum to the right of the right-to-left arrow in Fig. 11 indicates downstream data. Interactive channels (NTSC video or MPEG2) are in channels 74-79 (522 MHz to 552 MHz). Upstream data has a small bandwidth of 25 kHz in the frequency range of 5 MHz to 40 MHz.

5 Fig. 12 shows a high-level diagram of the home interface controller in communication with the back end. In this embodiment, downstream data is in the form of packet data on a 300 Kbps data channel. When providing upstream data, the home interface controller uses a dedicated upstream channel requiring only a 25 kHz bandwidth for each home interface controller, so as to provide noise immunity. Fig. 12 is
10 similar to Fig. 11, except that a common upstream channel is used by all the home interface controllers for hailing the back end. No carrier or collision detection algorithms are employed, but rather, any lost requests due to collisions among the home interface controllers are "detected" by an absence of response from the back end after a suitable time-out. This common upstream channel is used only briefly during an initial log-on to
15 request a private data channel, where the private data channel is indicated in Fig. 13. As an alternative to the use of a hailing channel, the system manager may include an arrangement for the periodic broadcast, from the headend over a downstream portion of the data link to the home interface controllers, identifying of available channels; in this embodiment, each home interface controller has a rule for picking one of the available
20 channels for use by the transmitter of its data transceiver.

Fig. 14 shows a block diagram of an alternative embodiment of the analog user service control module 212b including a frame grabber 203d and a TV tuner 203f which produces an analog television signal. At the request of a subscriber, control data may be directed to the PC card 202a via the distribution switches 201 for requesting a frame of
25 video from a television signal, a Uniform Resource Locator (URL) from a World Wide Web page in the Internet, or even an e-mail address from a television information signal to be saved in a storage medium 220. The storage medium in a preferred embodiment is a digital storage medium coupled to the PC card 202a via the distribution data switches 220 such as a hard drive, an optical storage media such as a recordable CD-rom disk or a
30 removable data diskette, such as the Jaz and Zip drive diskettes from Iomega Corporation. The storage medium is accessible system wide. The TV tuner 203f is coupled to the frame grabber 203d. As control information is received by the PC card

202a, a signal is sent to the frame grabber 203d, indicating the frame of video to be extracted, typically the current frame or a portion thereof. The frame grabber 203d may receive television signals from the TV tuner 203f, or signals from the back end 11 encompassing other services such as E-mail and Internet access. Once the frame is
5 isolated by the frame grabber 203d, the processor sends it to the storage medium for later recall by the subscriber. The processor attaches address information to the frame identifying the subscriber making the storage request. A subscriber may request immediate access to the grabbed frame bypassing the storage medium. For example, a subscriber might be watching a sporting event and wish to freeze a frame of video as an
10 important play unfolds. In such a situation, the subscriber indicates through the selection device that the frame is for immediate retrieval and once the frame is extracted by the frame grabber in its analog form it is transmitted directly to the home interface controller for display on the subscriber's television.

If requested by a subscriber the frame grabber 203d may be used to retrieve and
15 store multiple frames, so that a video clip may be saved from the television signal or from other sources from the back end 11.

In an alternative embodiment, the TV tuner 203f is coupled to a video mixer 203g and the video mixer 203g has an output which leads to the input of the frame grabber 203d. The video mixer 203g has multiple inputs which may receive multiple
20 video signals from the TV tuner 203f or from other sources from the back end 11 in response to a subscriber's request. The video mixer 203g mixes multiple signals to produce a combined signal of the input. In one embodiment, video signals from a TV tuner and a World Wide Web (WWW) page may be superimposed so that the signal from the TV tuner overlays the WWW page. The combined signal may then be passed to
25 the frame grabber 203d where the PC card 202a again, upon request, may save the frame from the frame grabber in the storage medium 220 route a signal indicating that the frame is to be extracted and saved for future recall.

The processor of the PC card 202a may be equipped so as to recognize characters in a video frame via optical character recognition (OCR) technology. Once a video frame
30 is extracted by the frame grabber 203d and digitized by the processor, text may be recognized through the OCR process creating a character recognition output which then may be saved in the storage medium. The OCR version of a digital video frame is

normally of a smaller digital storage size than the uncompressed video frame. This savings in frame size is useful in conserving storage space and is especially efficient if the subscriber only desires the text of a video frame, such as a URL address or E-mail address. The processor may be configured, so as to automatically recognize and store any

5 URL address that is present in a video frame. In another embodiment the URL address of a WWW page may be stored in the vertical blanking interval of the output frame. In this embodiment, the OCR process automatically extracts the URL address from the vertical blanking interval for storage in the storage medium.

If a subscriber wishes to recall information that has been saved by the frame

10 grabber, the user indicates his intention through the home interface controller by accessing controls on the subscriber selection device sending a signal to the head end which is directed to a PC card 202a assigned to the subscriber. The PC card 202a recalls the digital information from the storage medium 220 relating to the subscriber's request and processes the digital information for transmission in analog form. The PC card 202a

15 further includes a video adapter card which transforms the digital information into a standard analog video display format such as video graphics array (VGA), super video graphics array (SVGA) or extended video graphics array (XVGA). The analog signal is then converted to a standard television format in the video display to NTSC/PAL converter 203a in the NTSC/PAL TV modulator 203. The NTSC/PAL TV modulator

20 further includes a scrambler 203b and an RF modulator 203c for conversion to an information signal that can be transmitted to the requesting home interface controller and displayed on the television set of the subscriber.

In another embodiment in which the television signal is digital, the frame grabber may operate in a similar fashion to its analog counterpart without the need for

25 transitioning the signal between analog and digital. A digital signal containing information from sources in the back end 11 which are transferred through the distribution data switches 201 to the PC card 202a such as a decoded MPEG movie, or WWW pages, or a digital television signal from the TV tuner may be directed through the frame grabber. In response to a request by a subscriber the frame grabber can isolate

30 the requested frame and either store the frame to a digital storage medium or transmit the frame to the subscriber's home interface controller.

Although various exemplary embodiments of the invention have been disclosed, it should be apparent to those skilled in the art that various changes and modifications can be made which will achieve some of the advantages of the invention without departing from the true scope of the invention. These and other obvious modifications
5 are intended to be covered by the appended claims.

WE CLAIM:

1. In an interactive television information system having an information service distribution network for supplying a plurality of information services from a headend to any of a plurality of subscriber televisions, each subscriber television having
5 communication access to a home interface controller connected to the information service distribution network, the improvement comprising:
at least one printer coupled to an interface controller connected to a data communication link;
a selection input in each of said home interface controllers for receiving signals
10 from a subscriber selection device including print request signals which cause the home interface controller to generate print command control data; and
a processor, disposed in said headend, responsive to the print command control data from the home interface controller to provide information for printing and transmitting said information over the data communication link to the interface
15 controller coupled to one of said at least one printers.
2. The interactive television information system according to claim 1 wherein said processor is one of a plurality of processors, each processor being an assignable module to one of said home interface controllers in interactive mode.
20
3. The interactive television information system according to claim 2 wherein each of said processors is removably installable.
4. The interactive television information system according to claim 1
25 wherein the data communication link is over the information service distribution network.
5. The interactive television information system according to claim 4 wherein the information service distribution network comprises a plurality of trunks in
30 communication with the headend for delivering the information services to subscriber televisions, each trunk being coupled to a different group of subscriber televisions and different ones of said at least one printers and wherein the information transmitted over

--
the data communication link is transmitted on the trunk coupled to the one of the interface controllers coupled to said one of said at least one printers.

6. The interactive television information system according to claim 4
5 wherein the data communication link is operative at a radio frequency independent of any frequency used for television communication over the network.

7. The interactive television information system according to claim 1
wherein the information sent by the processor over the data communication link includes
10 a screen displayed on the subscriber television of the home interface controller issuing the print command.

8. The interactive television information system according to claim 1
wherein the print command control data includes a printer selection and said processor
15 transmits said information to the selected one of said at least one printers.

9. An interactive television information system, for providing interactive cable television service when coupled to a cable television system having (i) an information source available at a headend for supplying a plurality of information
20 services and (ii) an information service distribution network in communication with the headend for delivering the information services to subscriber televisions, the interactive television system comprising:

a plurality of home interface controllers, one such home interface controller associated with each subscriber television and having an interactive mode as
25 well as (a) a data transmitter, operative over a data communication link to the headend; and (b) a selection input for receiving signals from a subscriber selection device;

at least one printer;

at least one interface controller, each coupled to one of the at least one printers and having a data transceiver operative over the data communication link to the
30 headend;

a processor, disposed at the headend and available to the data communication link, providing an information signal for transmission via the

information service distribution network to a subscriber television associated with a given one of the home interface controllers in response to control data resulting from subscriber input to the given one of the home interface controllers via the subscriber selection device; and

- 5 wherein a subscriber may issue a print command designating one of said at least one printers by making a selection through the selection input to generate control data which causes the processor to provide information that is sent over the data communication link to the interface controller coupled to said one of said at least one printers designated by the subscriber.

10

10. The interactive television information system according to claim 9 wherein said processor is one of a plurality of processors, each processor being an assignable module to one of said home interface controllers in interactive mode.

- 15 11. The interactive television information system according to claim 10 wherein each of said processors is removably installable.

12. The interactive television information system according to claim 9 wherein the data communication link is over the network.

20

13. The interactive television information system according to claim 12 wherein the information service distribution network comprises a plurality of trunks in communication with the headend for delivering the information services to subscriber televisions, each trunk being coupled to a different group of subscriber televisions and
25 different ones of said at least one printers and wherein the information sent over the data communication link is transmitted on the trunk coupled to the one of the interface controllers coupled to said one of said at least one printers designated by the subscriber.

14. The interactive television information system according to claim 12
30 wherein the data communication link is operative at a radio frequency independent of any frequency used for television communication over the network.

15. The interactive television information system according to claim 9 wherein the information sent by the processor over the data communication link includes a screen displayed on the subscriber television of the subscriber issuing the print command.

5

16. The interactive television information system according to claim 9 wherein (i) the processor receives the control data over the data communication link from the data transmitter of the given home interface controller and (ii) the content of the information signal is modified in response to the control data resulting from subscriber
10 input via the subscriber selection device.

17. A method of printing through an interactive television information system comprising:

transmitting a television information signal over an information service
15 distribution network from a headend to a subscriber television;
receiving, at the headend, control data, containing a print command for a selected printer, from a home interface controller associated with the subscriber television; and
sending an information signal to be printed from the headend through a data
communication link to the selected printer.

20

18. The method of claim 17 wherein the subscriber television displays an image generated by the television information signal and wherein said step of sending an information signal causes the image displayed on the subscriber television to be printed.

25 19. A method of printing through an interactive television information system comprising:

transmitting a television information signal over an information service
distribution network from a headend to a subscriber television;
inputting a print command to a home interface controller associated with the
30 subscriber television displaying an image generated by the television information signal;
generating control data in the home interface controller responsive to said print
command;

--
transmitting the control data through a data communication link from the home interface controller to a headend;

sending an information signal to be printed from the headend through the data communication link;

5 receiving the information signal at an interface controller; and

printing an image generated by the information signal on a printer coupled to the interface controller.

20. The method of claim 19 wherein the image generated by the information
10 signal is the image displayed on the subscriber television set.

21. The method of claim 19 further comprising selecting a printer in addition to inputting a print command and wherein the image is printed at the selected printer.

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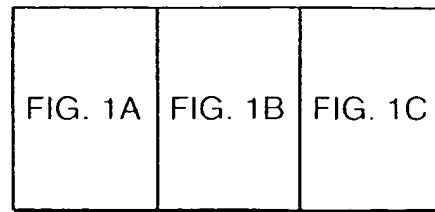
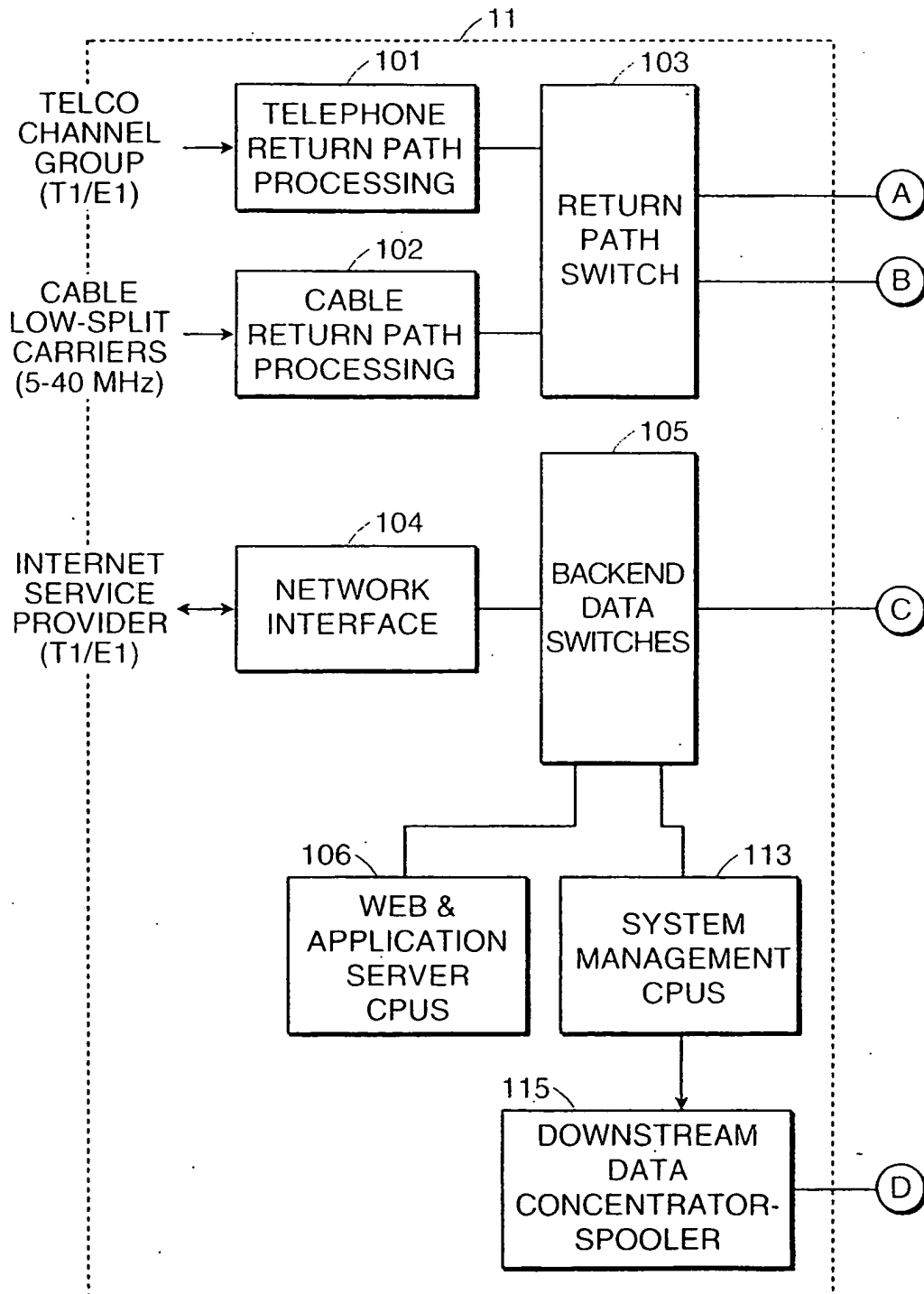


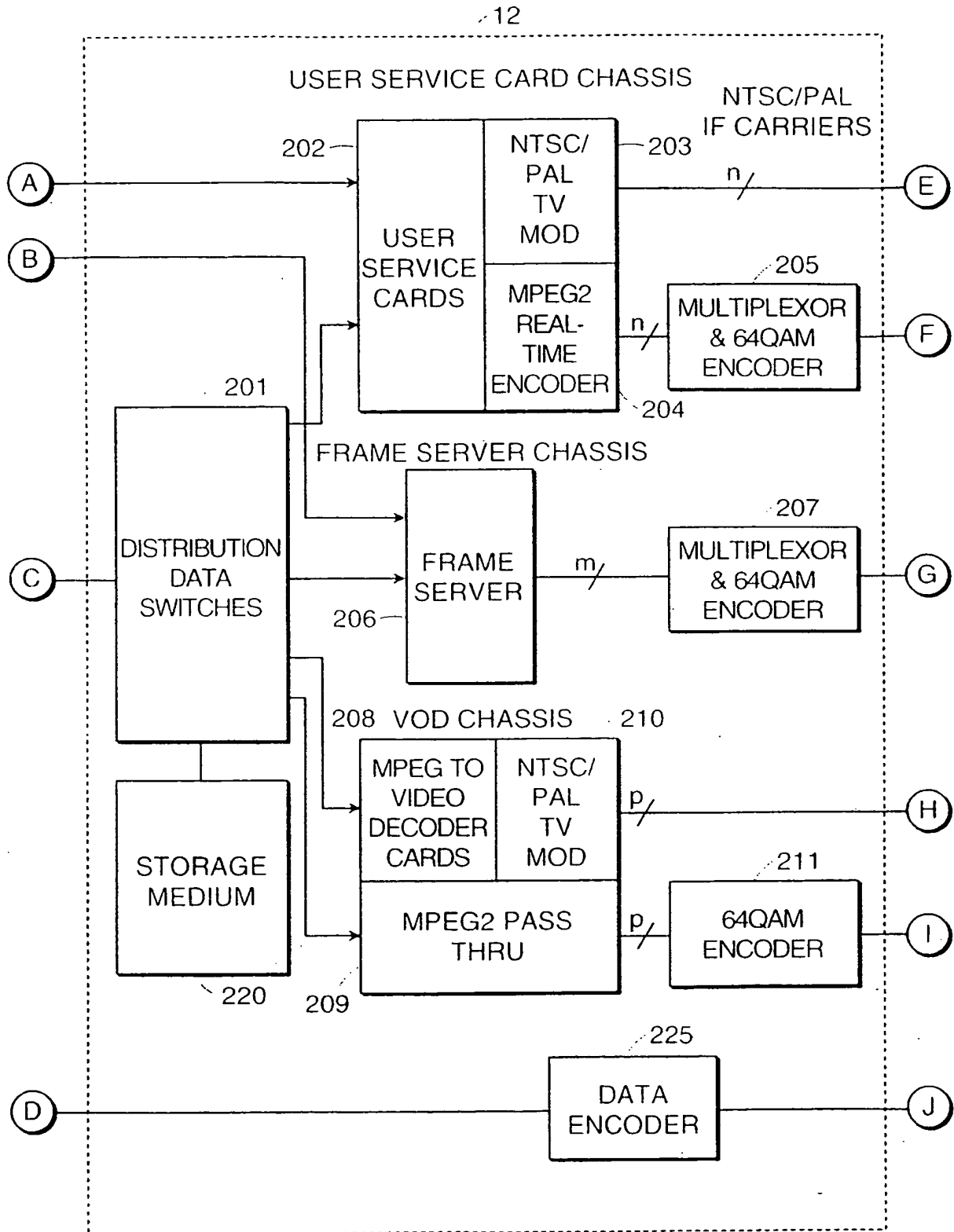
FIG. 1

FIG. 1A



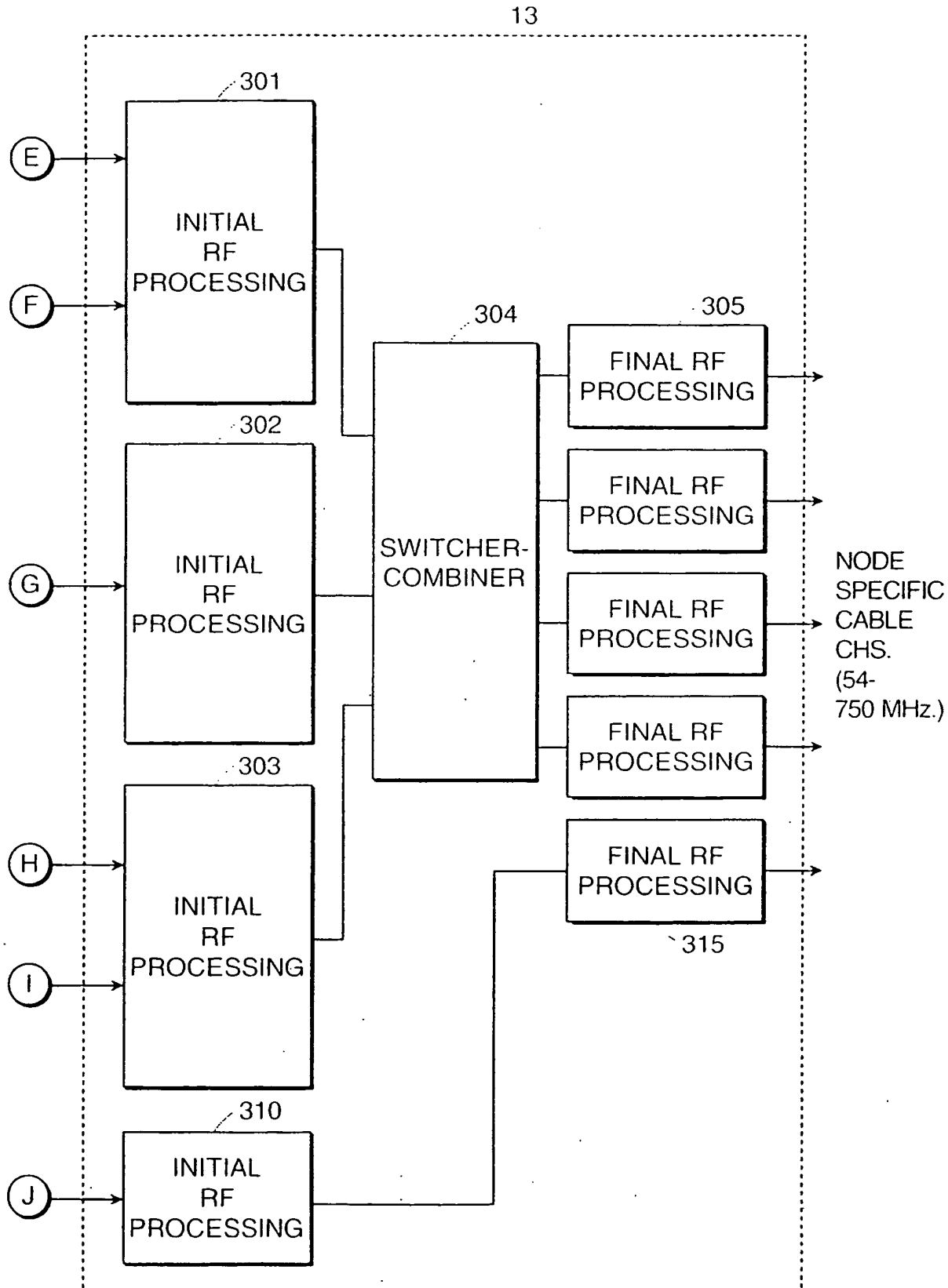
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FIG. 1B



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FIG. 1C



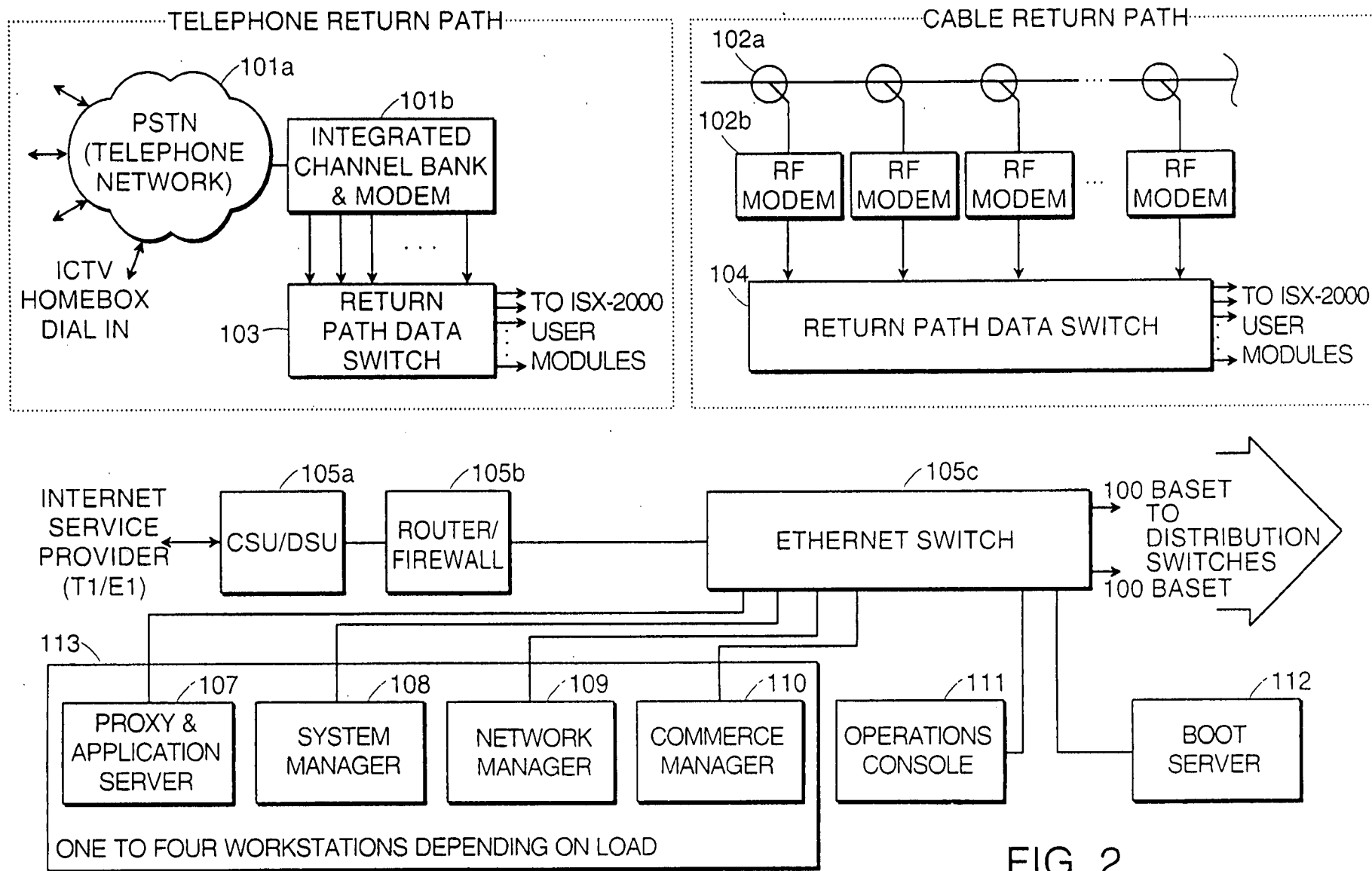
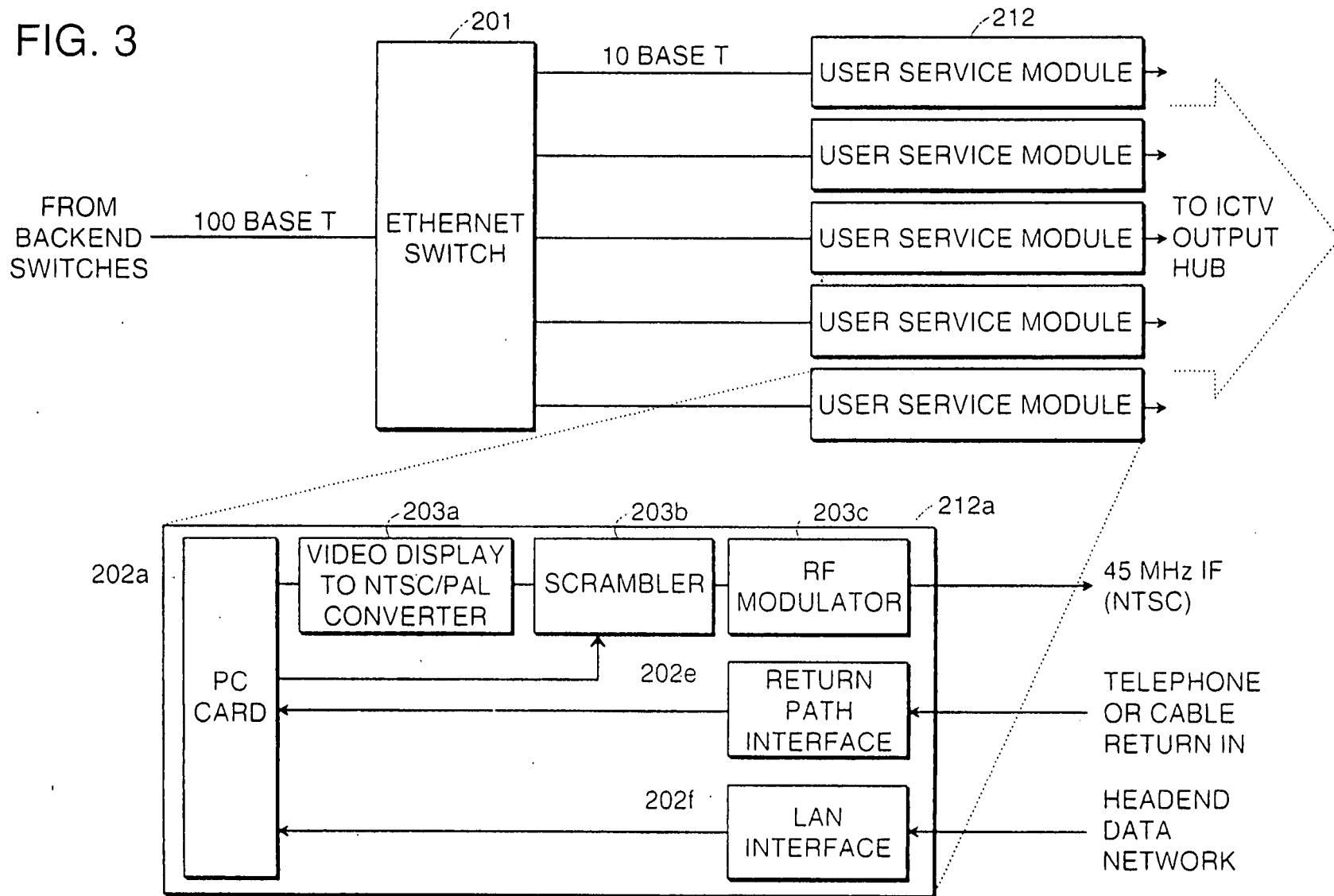


FIG. 2

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FIG. 3



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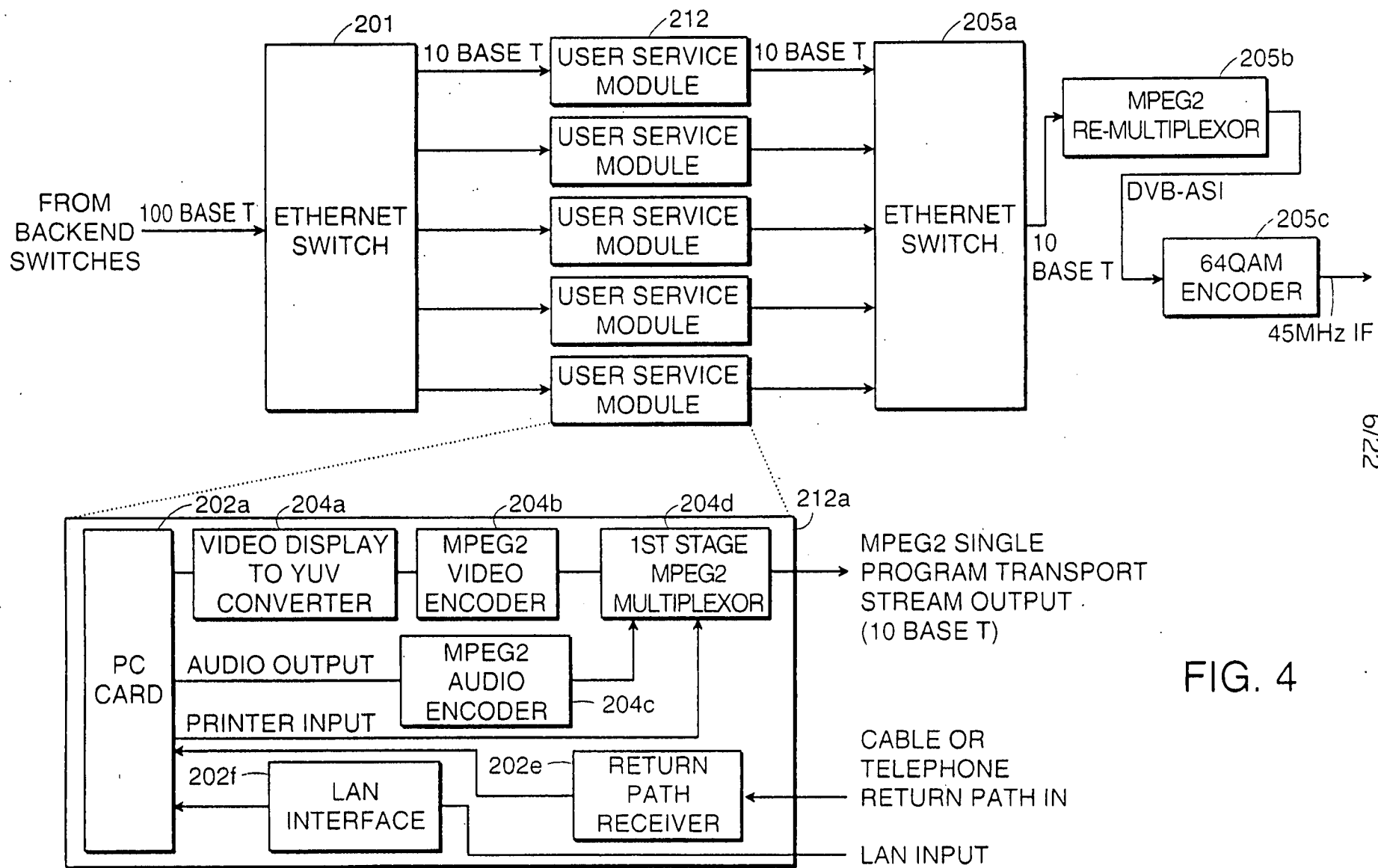


FIG. 4

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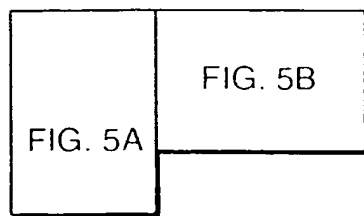
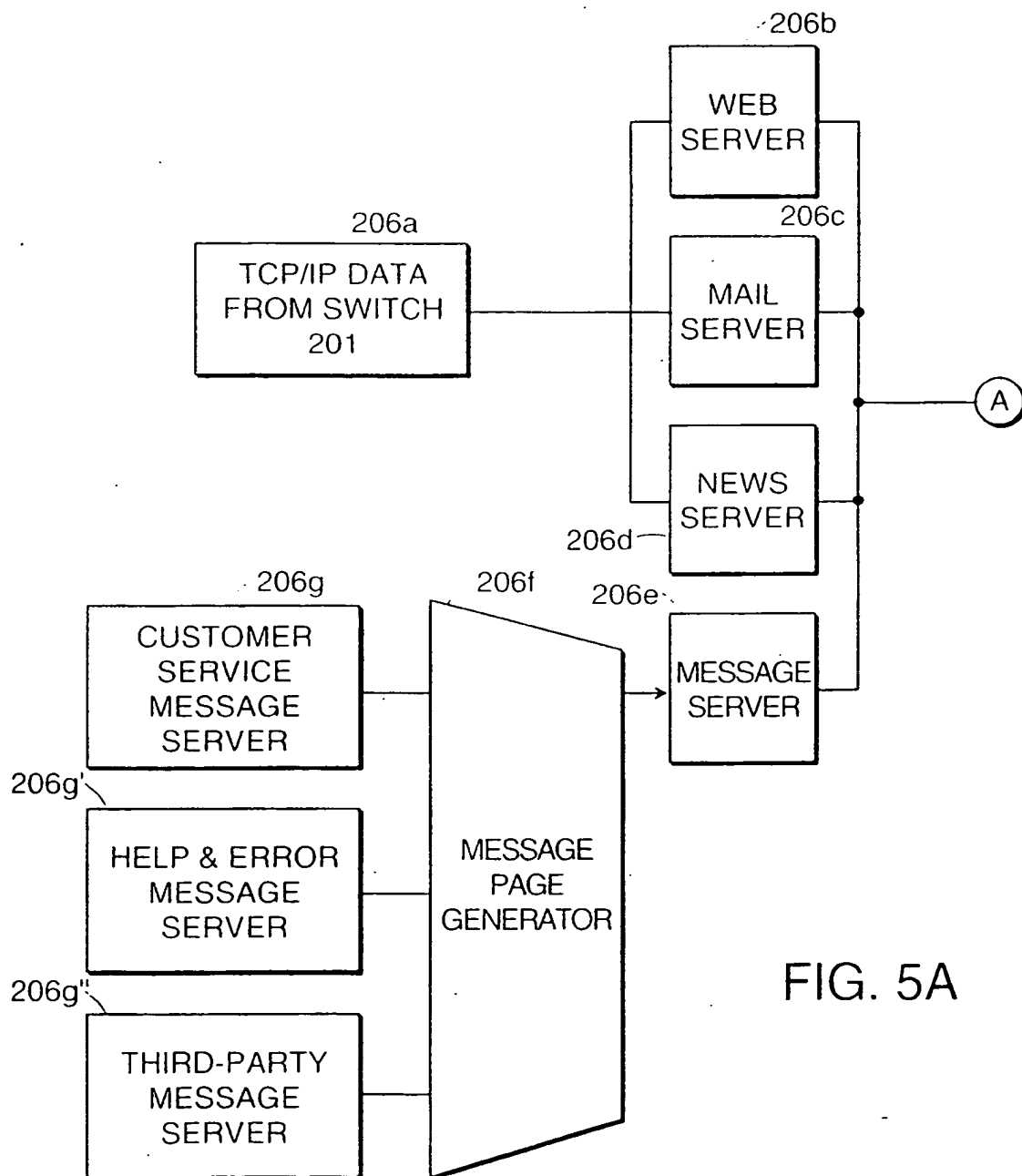
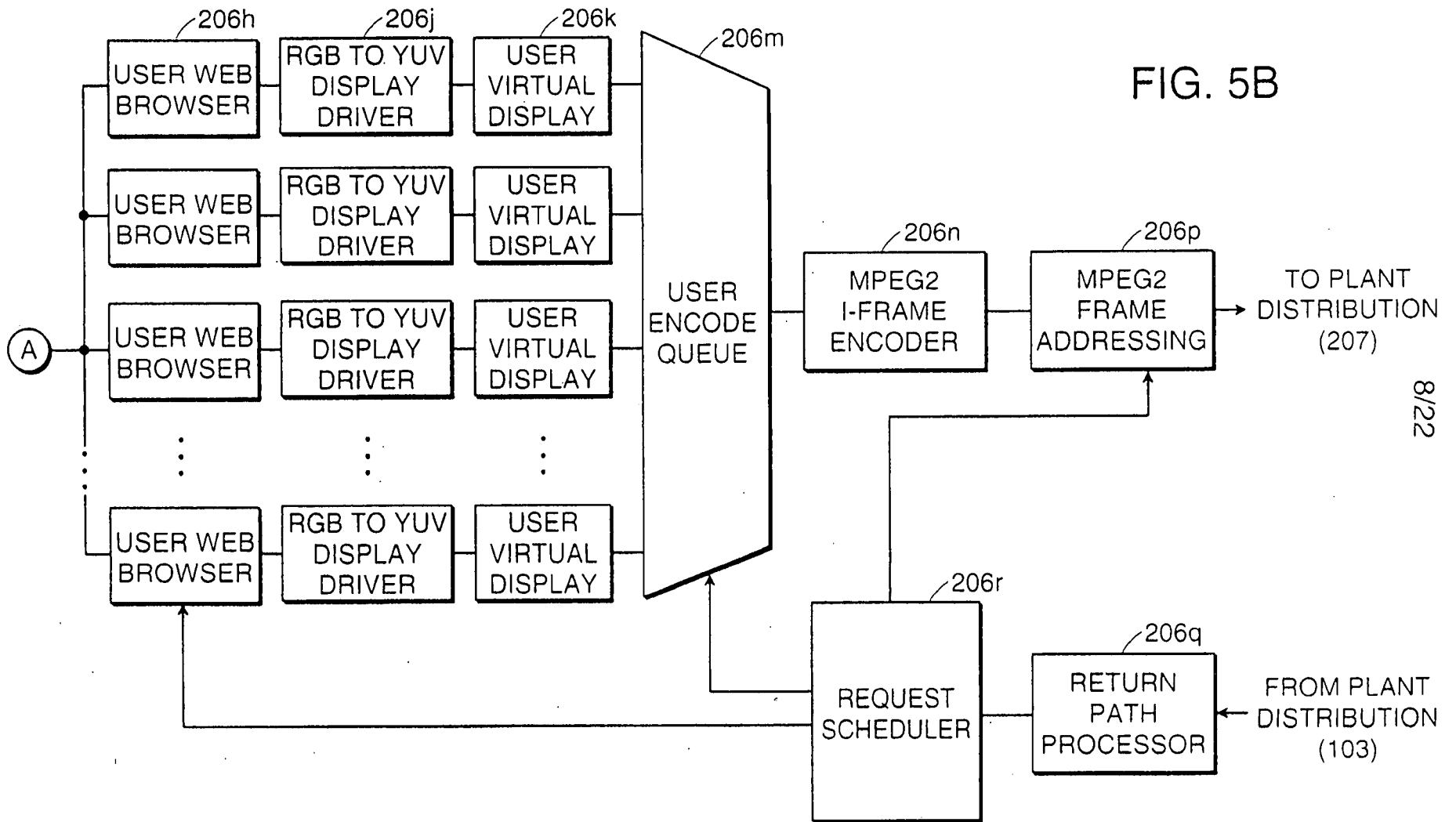


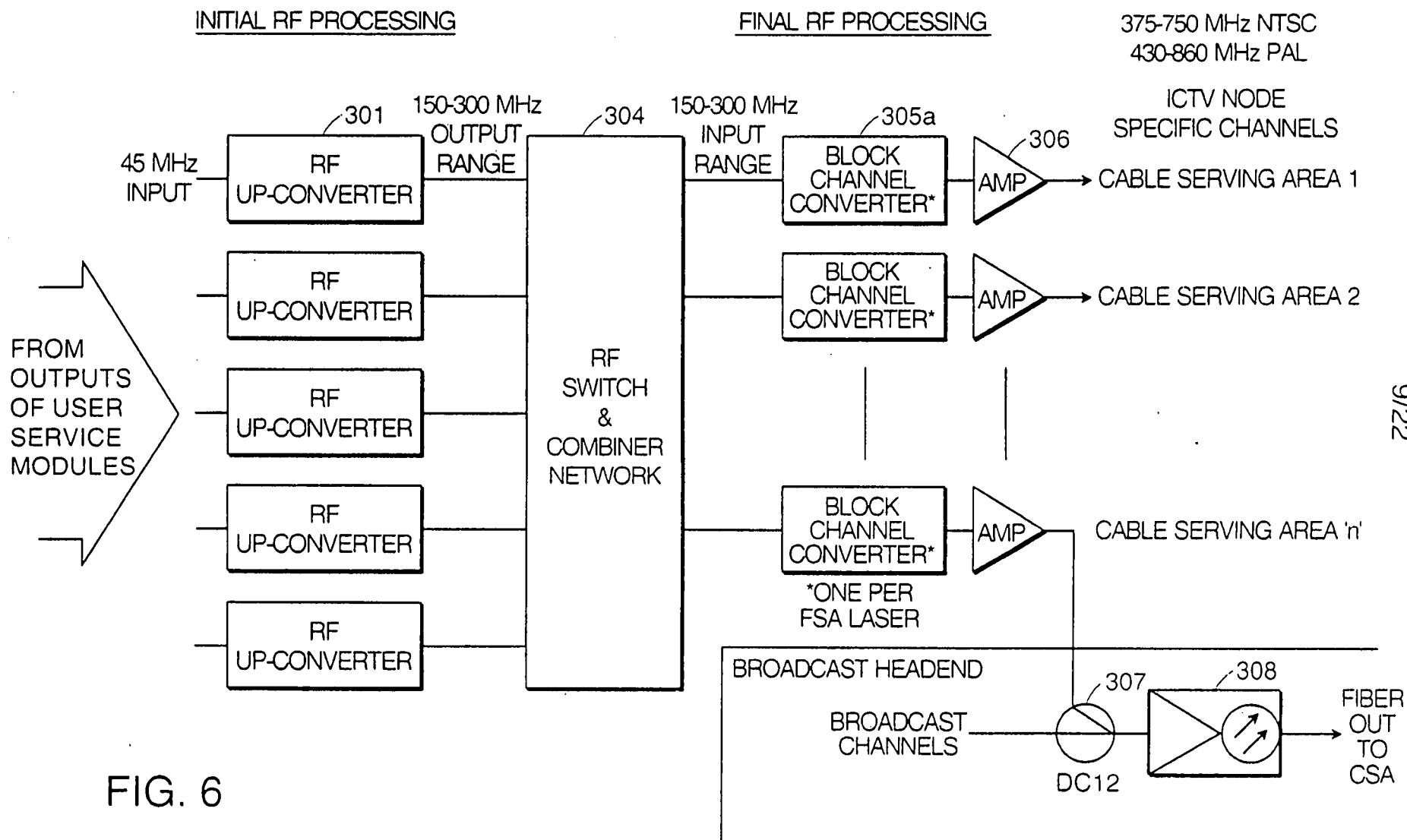
FIG. 5



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FIG. 5B





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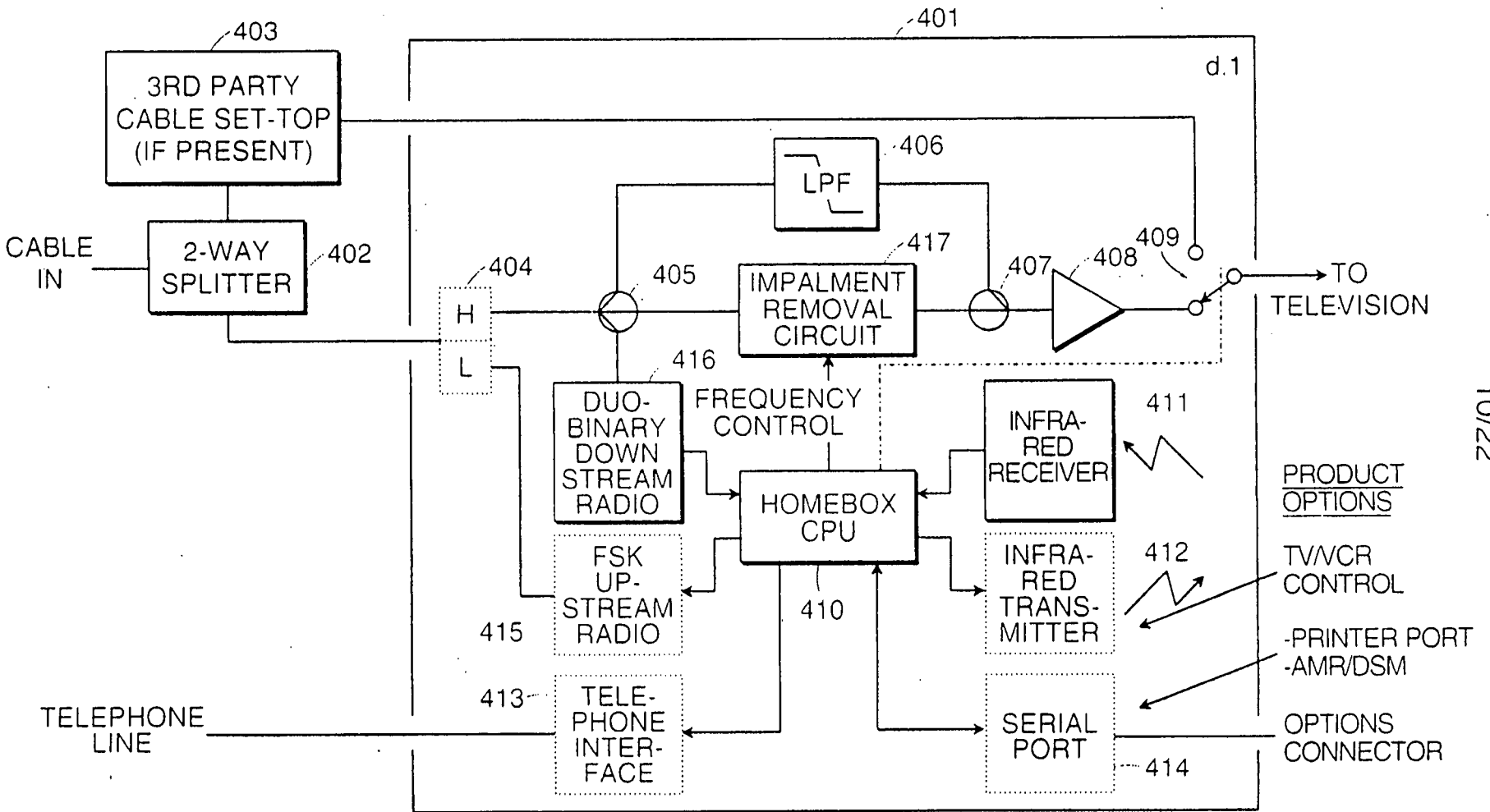


FIG. 7

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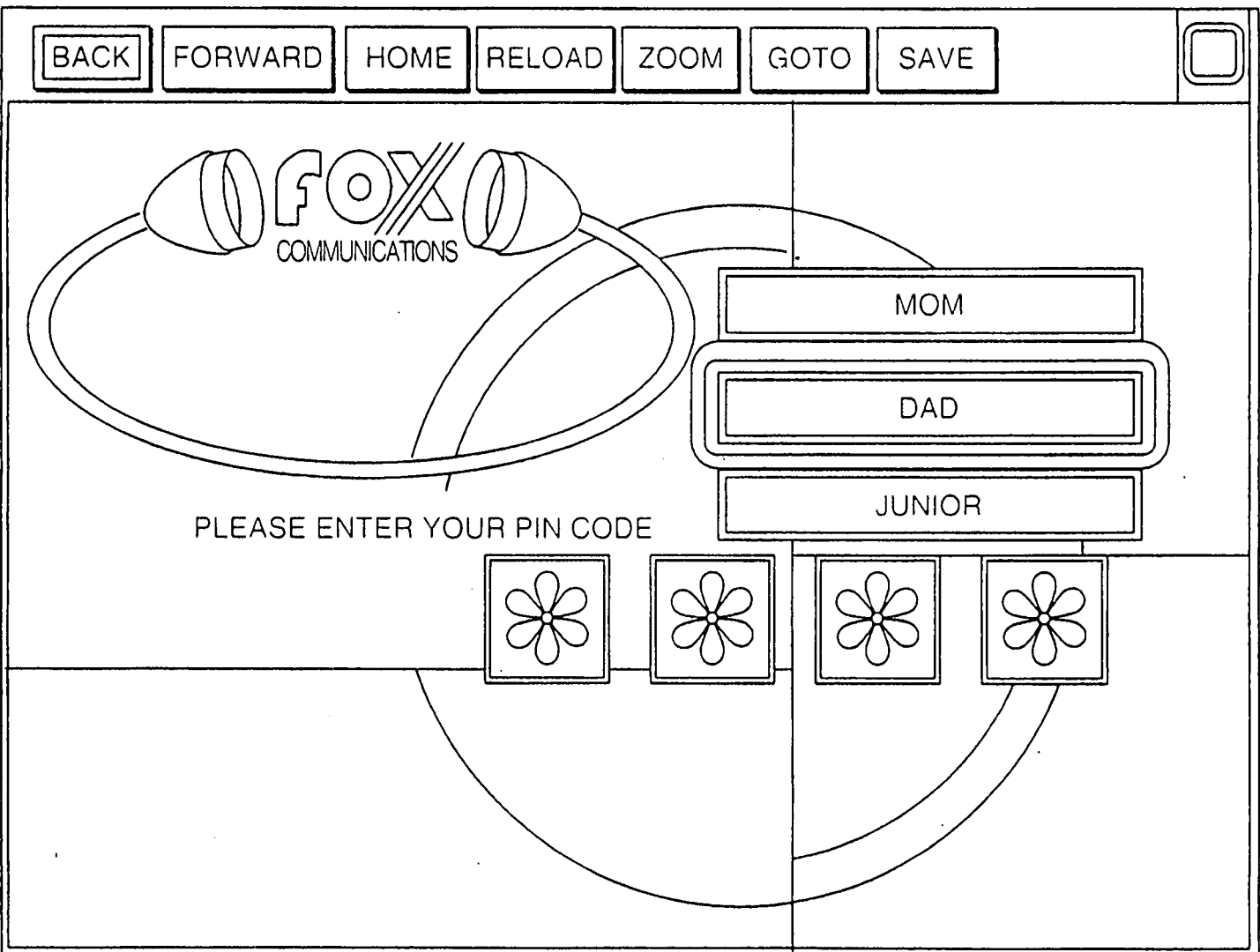


FIG. 8A

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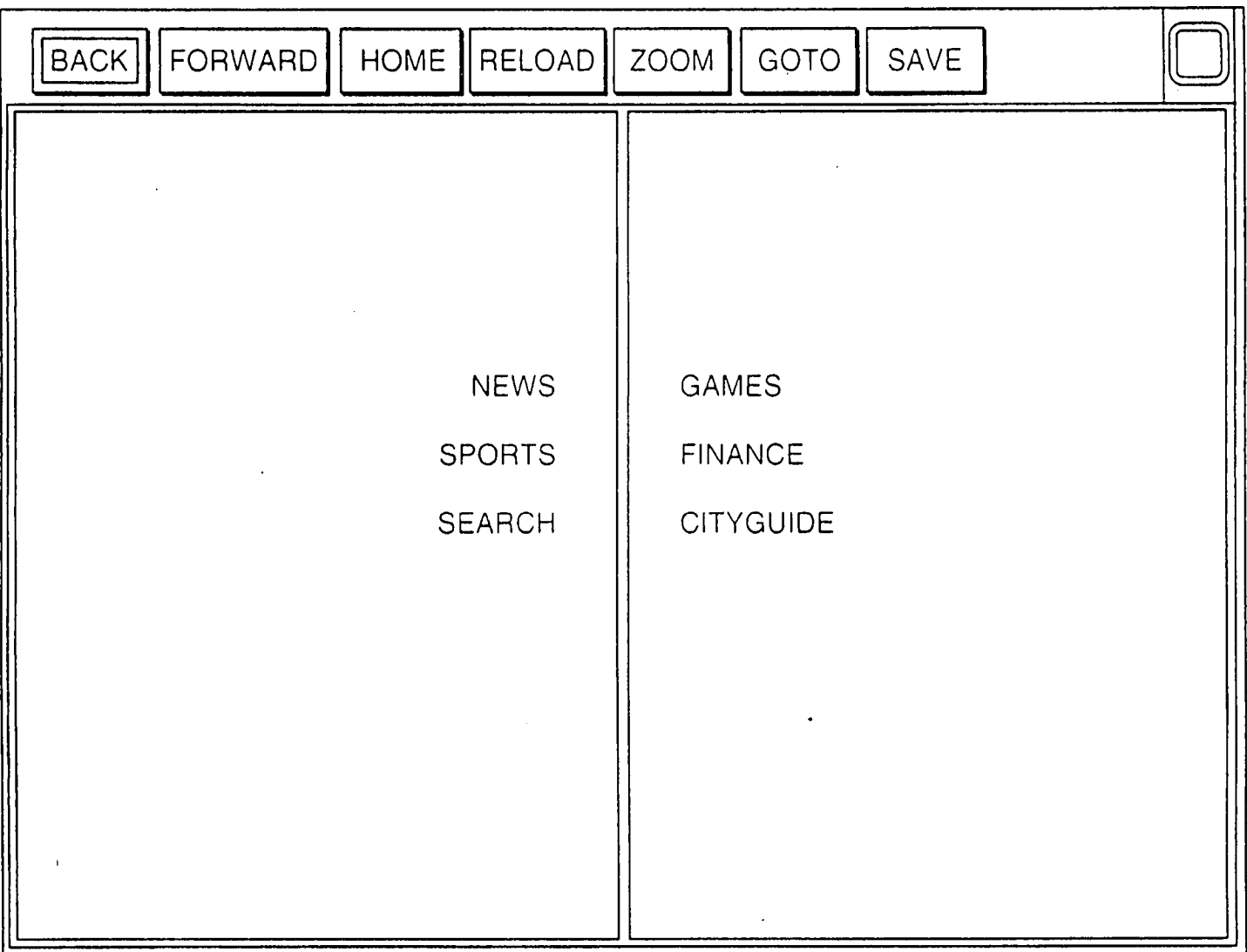


FIG. 8B

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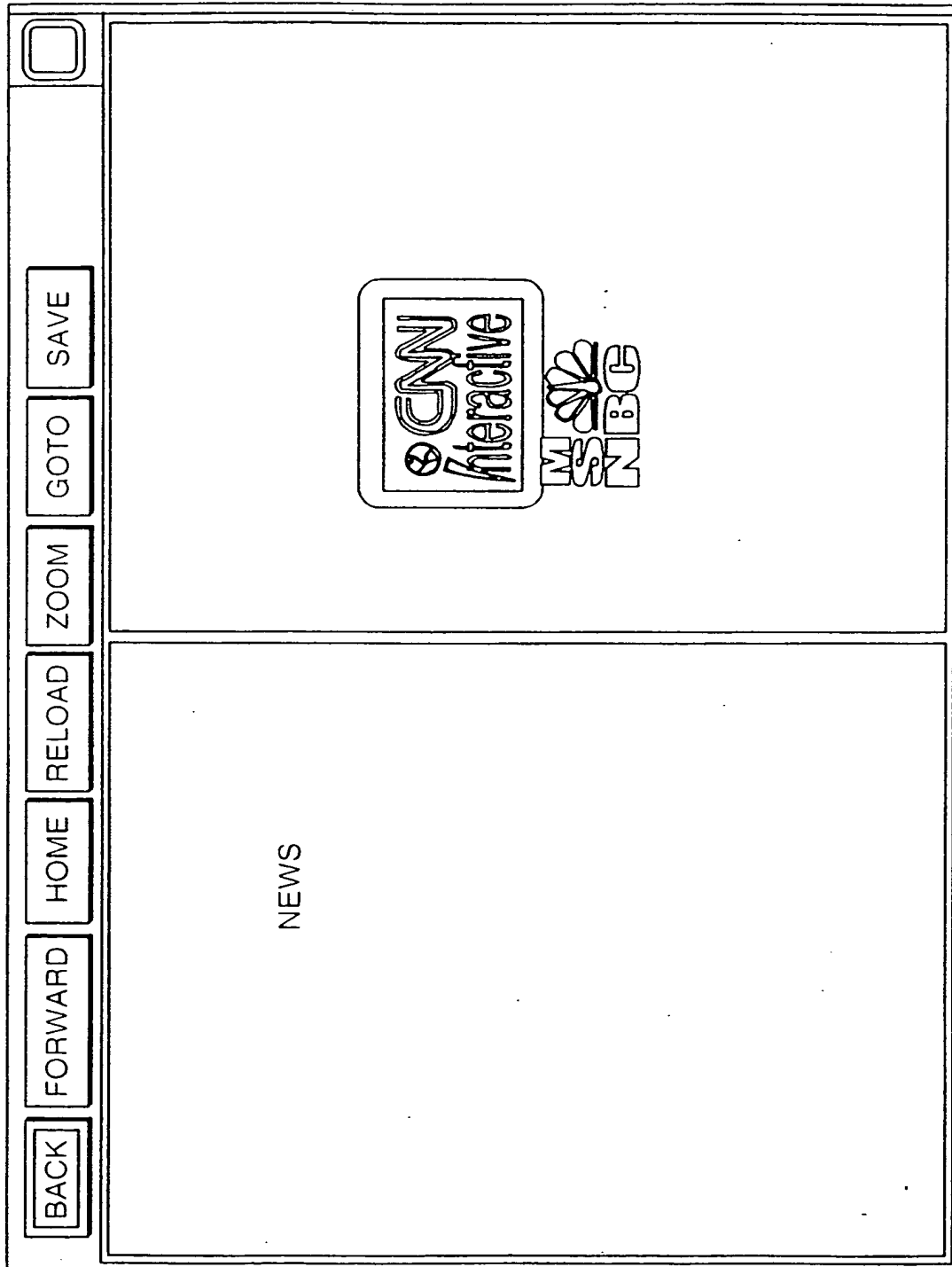


FIG. 8C

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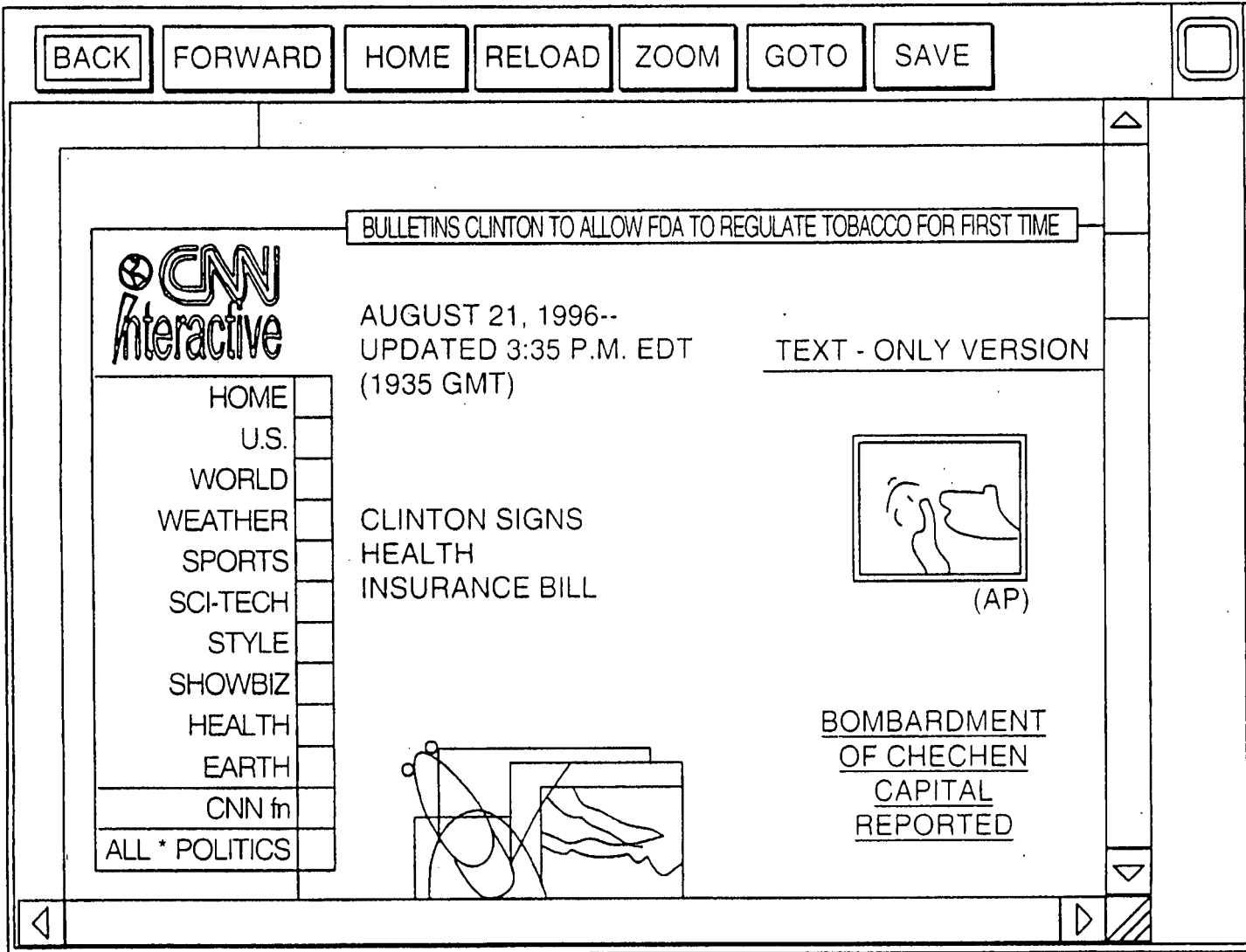
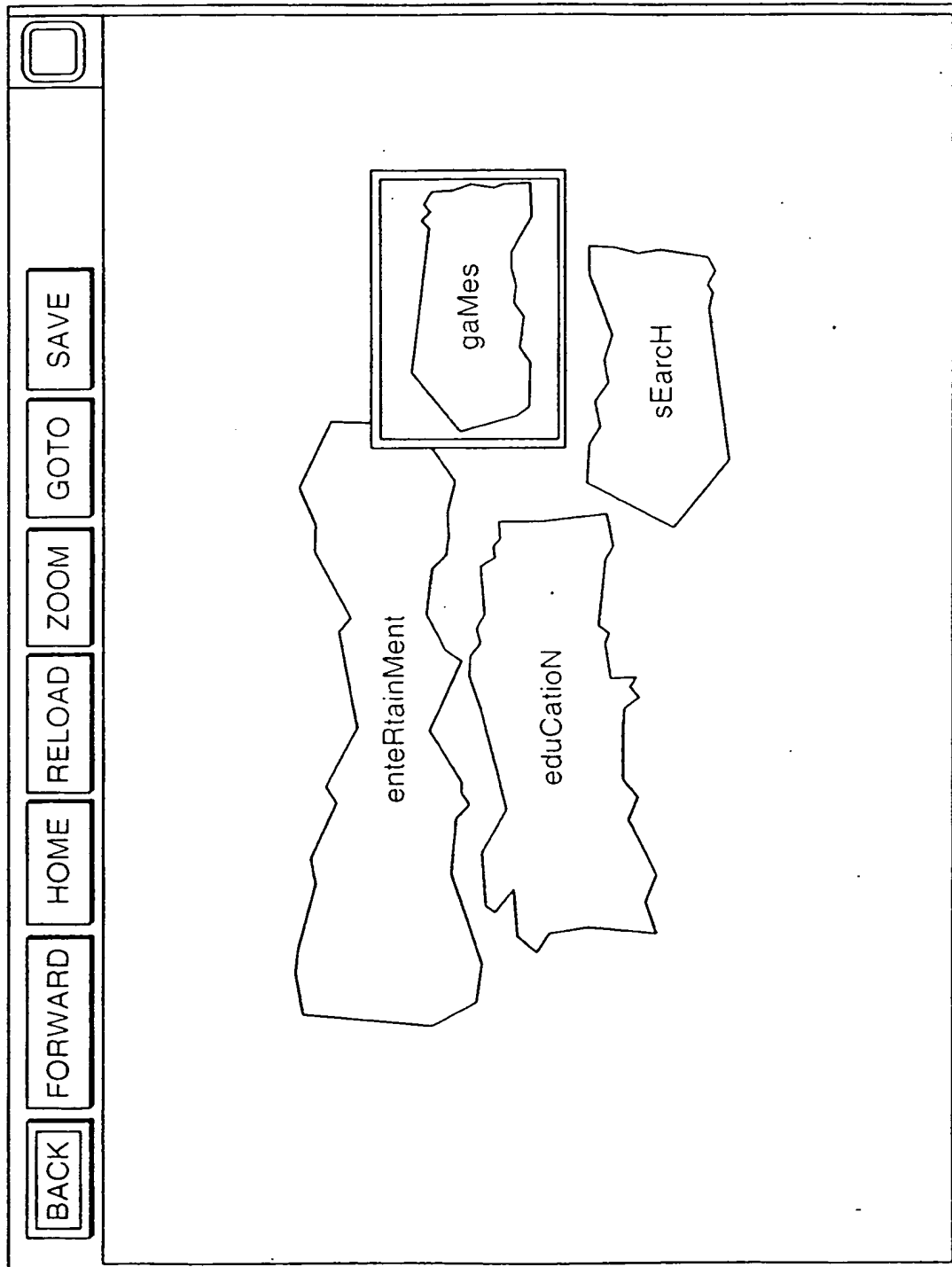


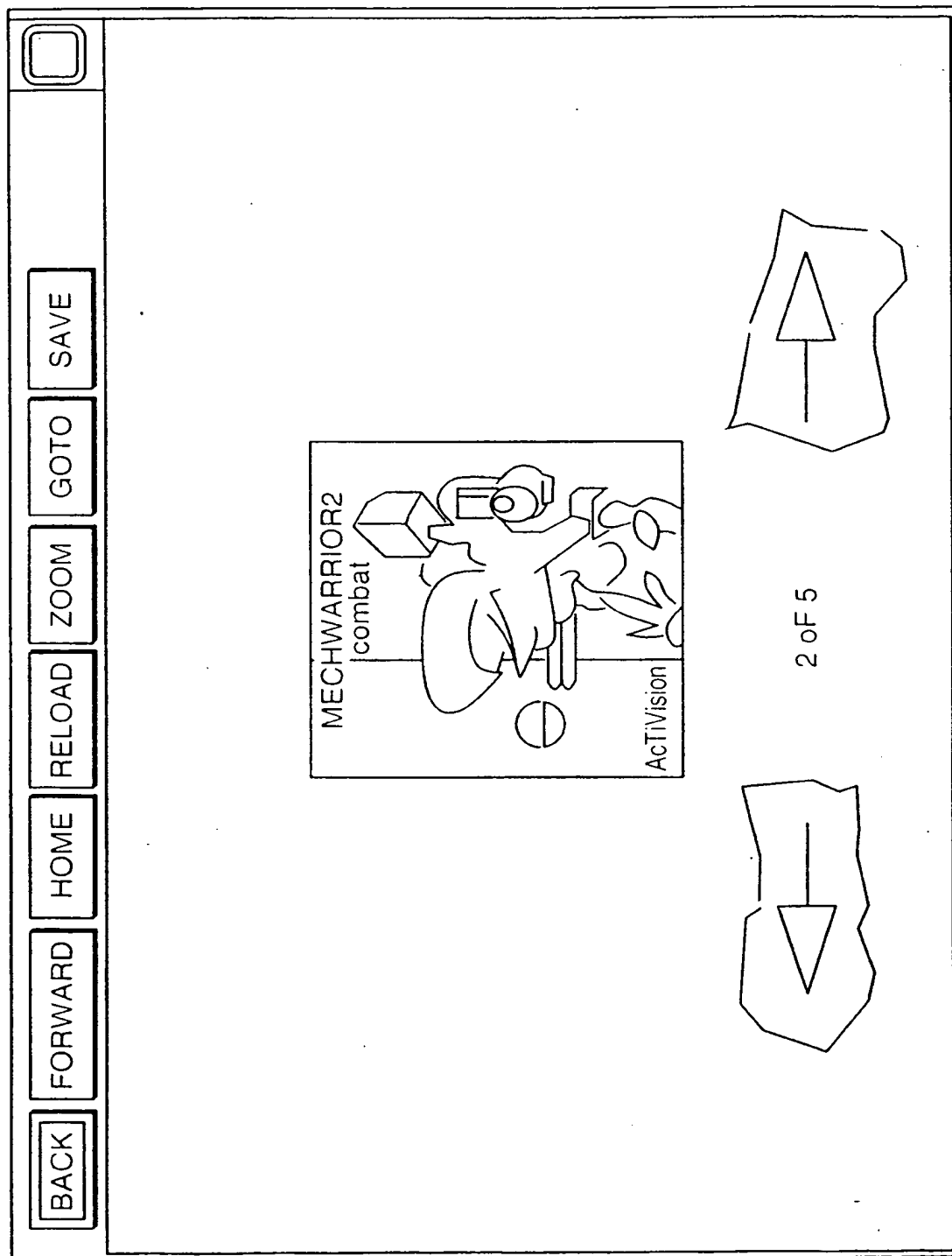
FIG. 8D

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FIG. 8F



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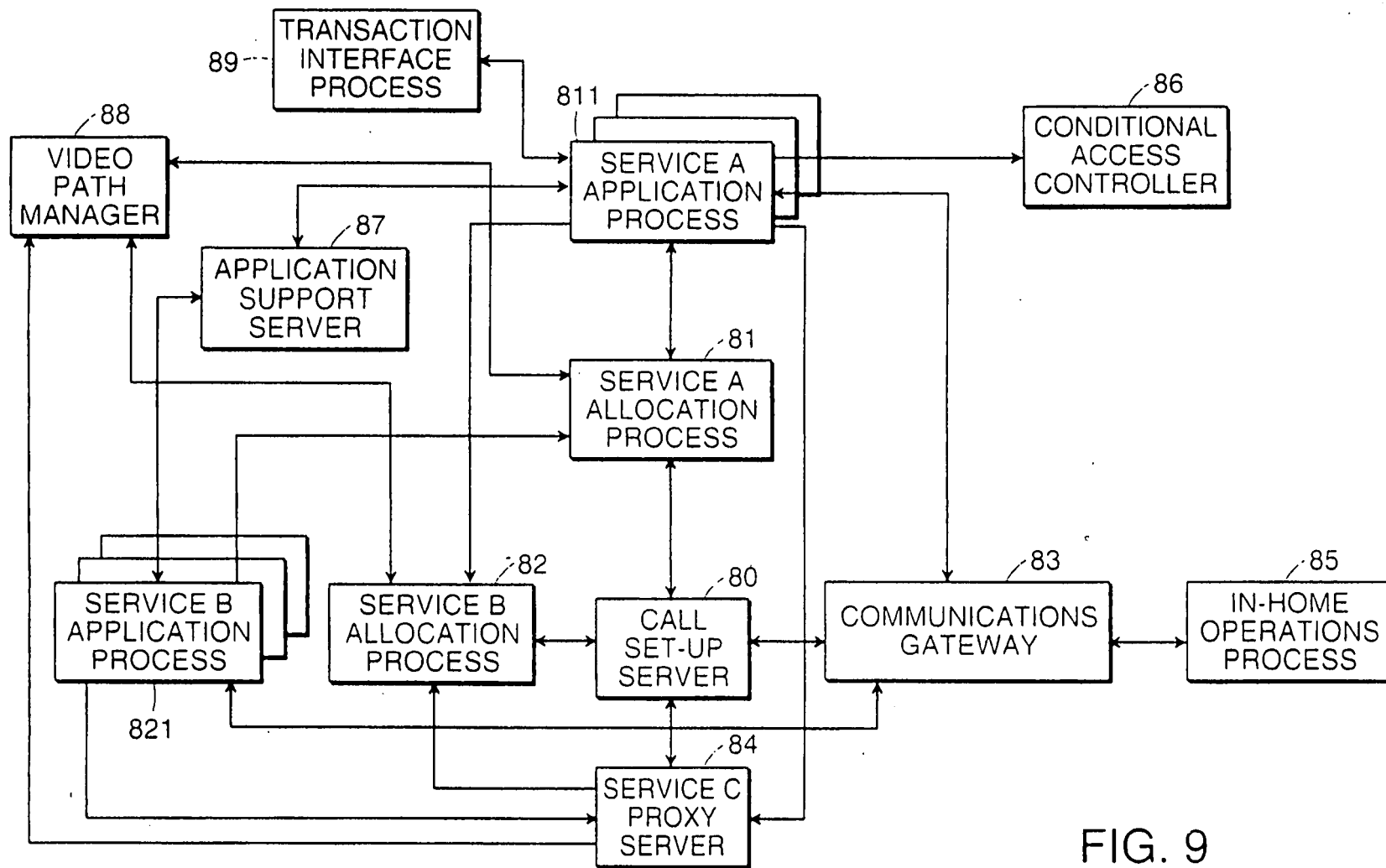


FIG. 9

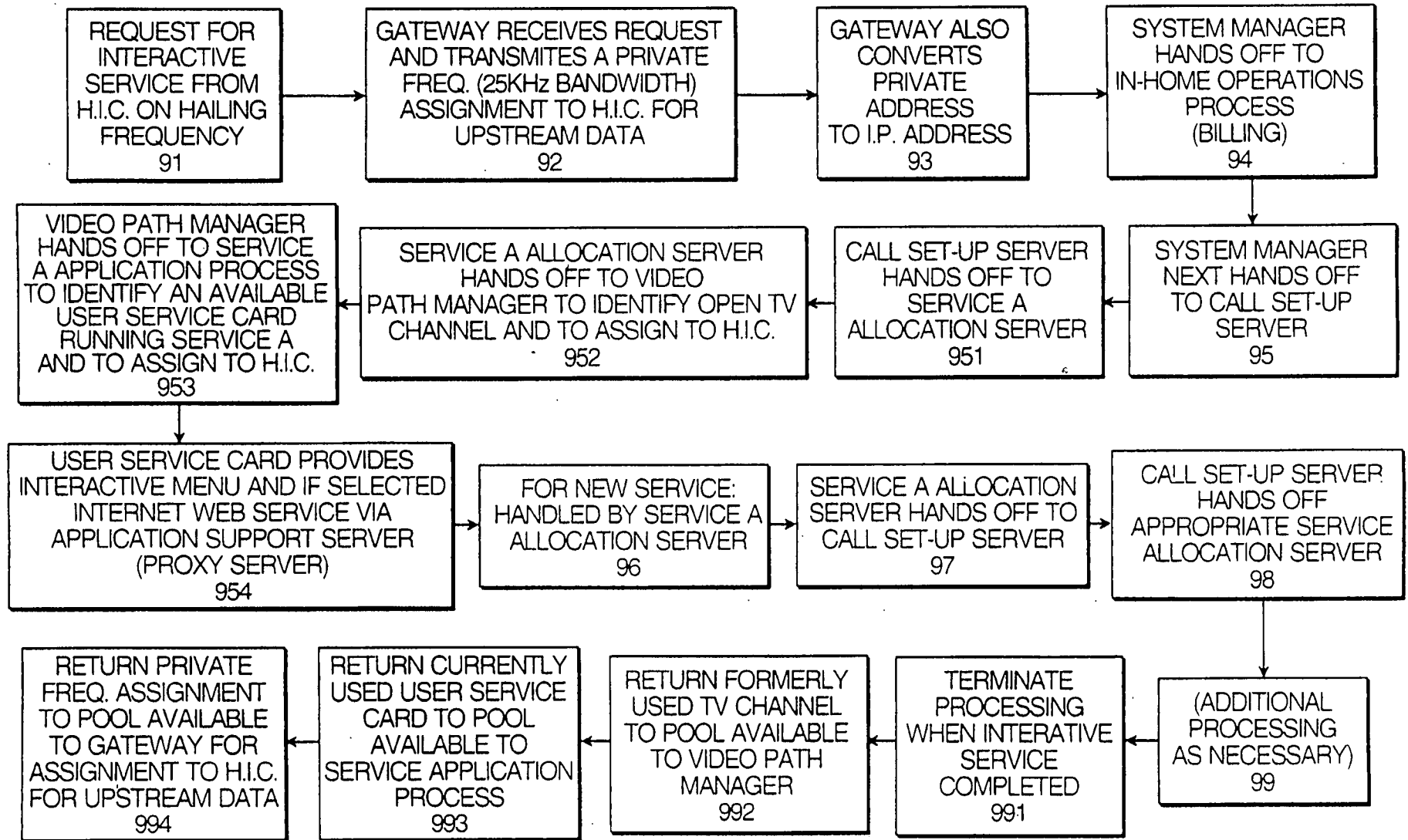


FIG. 10

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ICTV SPECTRUM UTILIZATION ON A 550 MHz PLANT

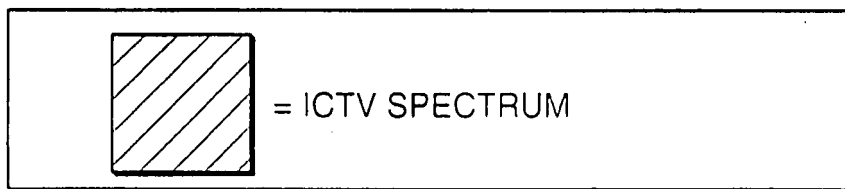
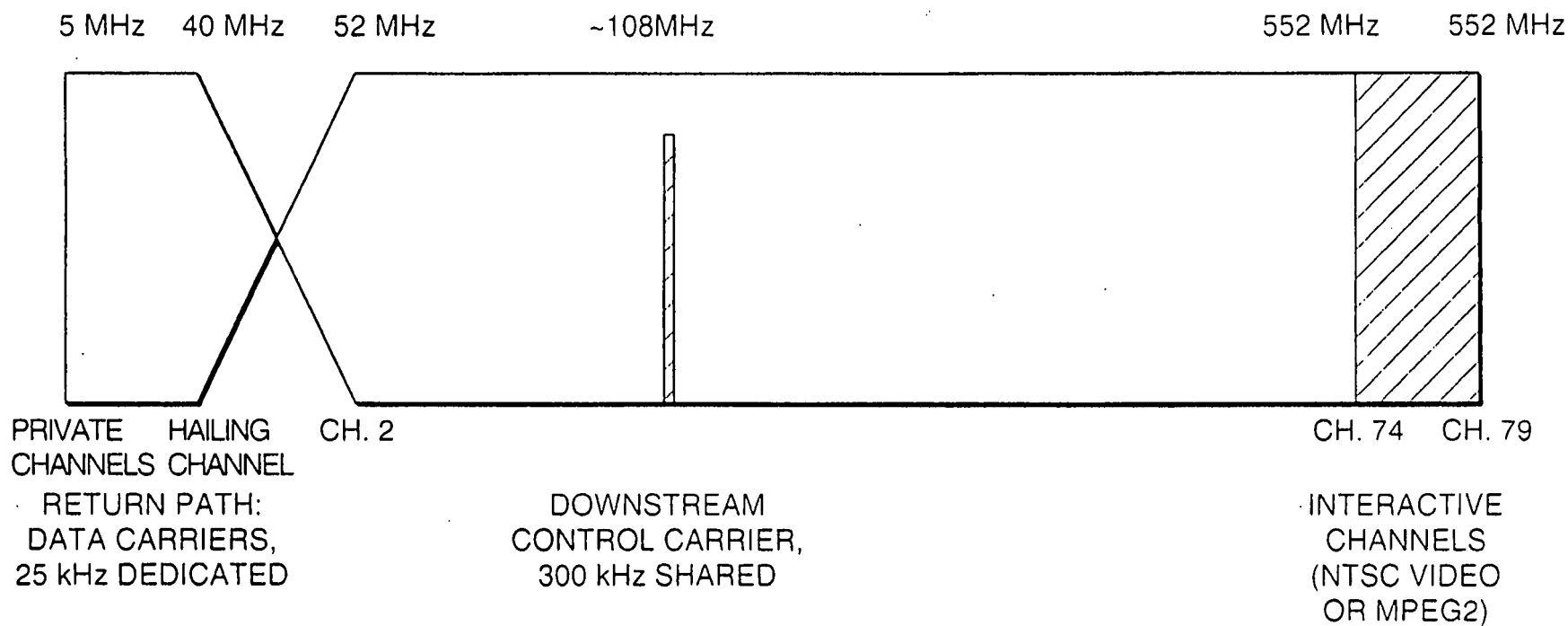


FIG. 11

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ICTV CDSL-2 CABLE RETURN SYSTEM: SERVICE REQUEST

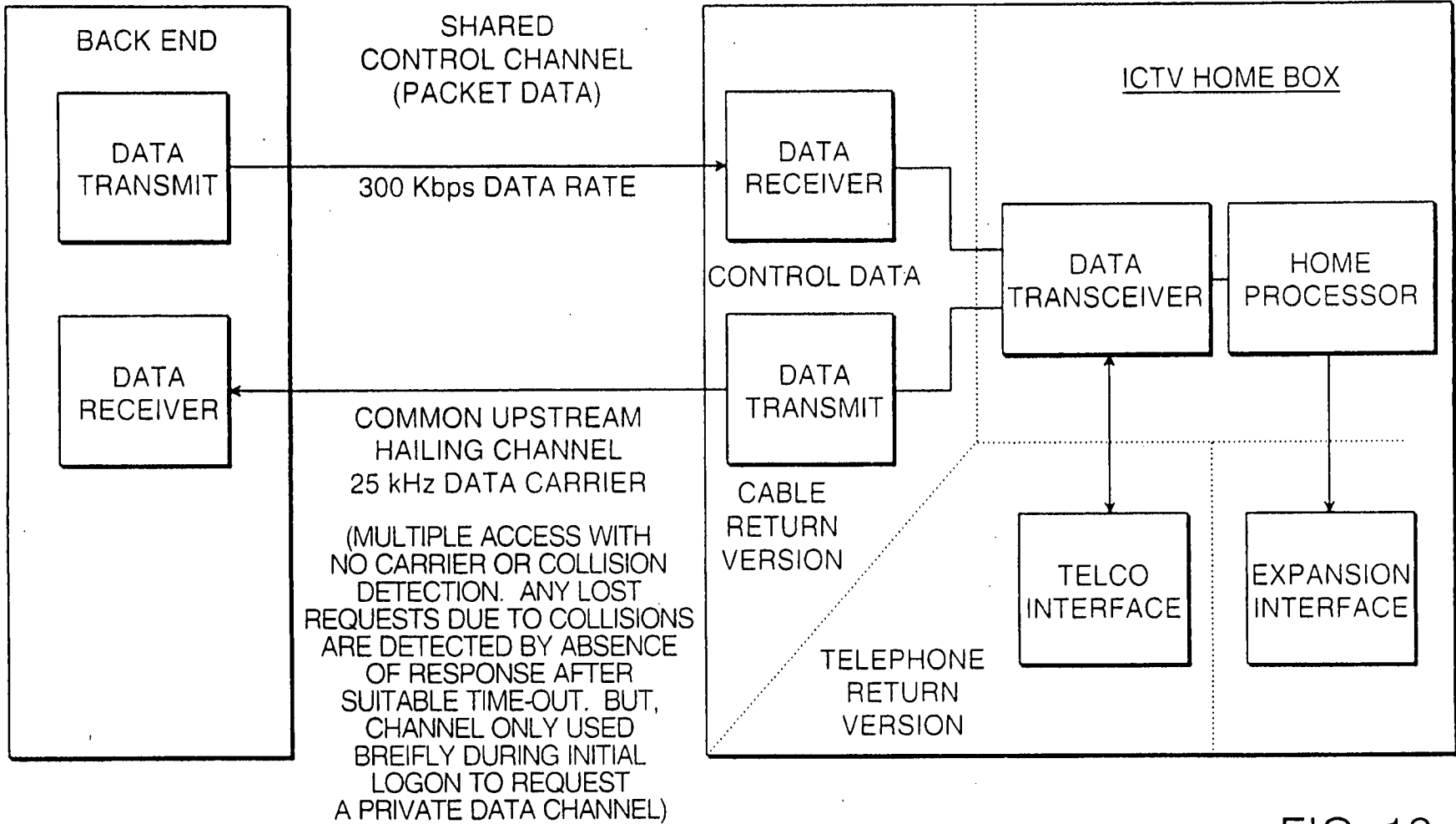


FIG. 12

ICTV CDSL-2 CABLE RETURN SYSTEM:
SERVICE ESTABLISHED

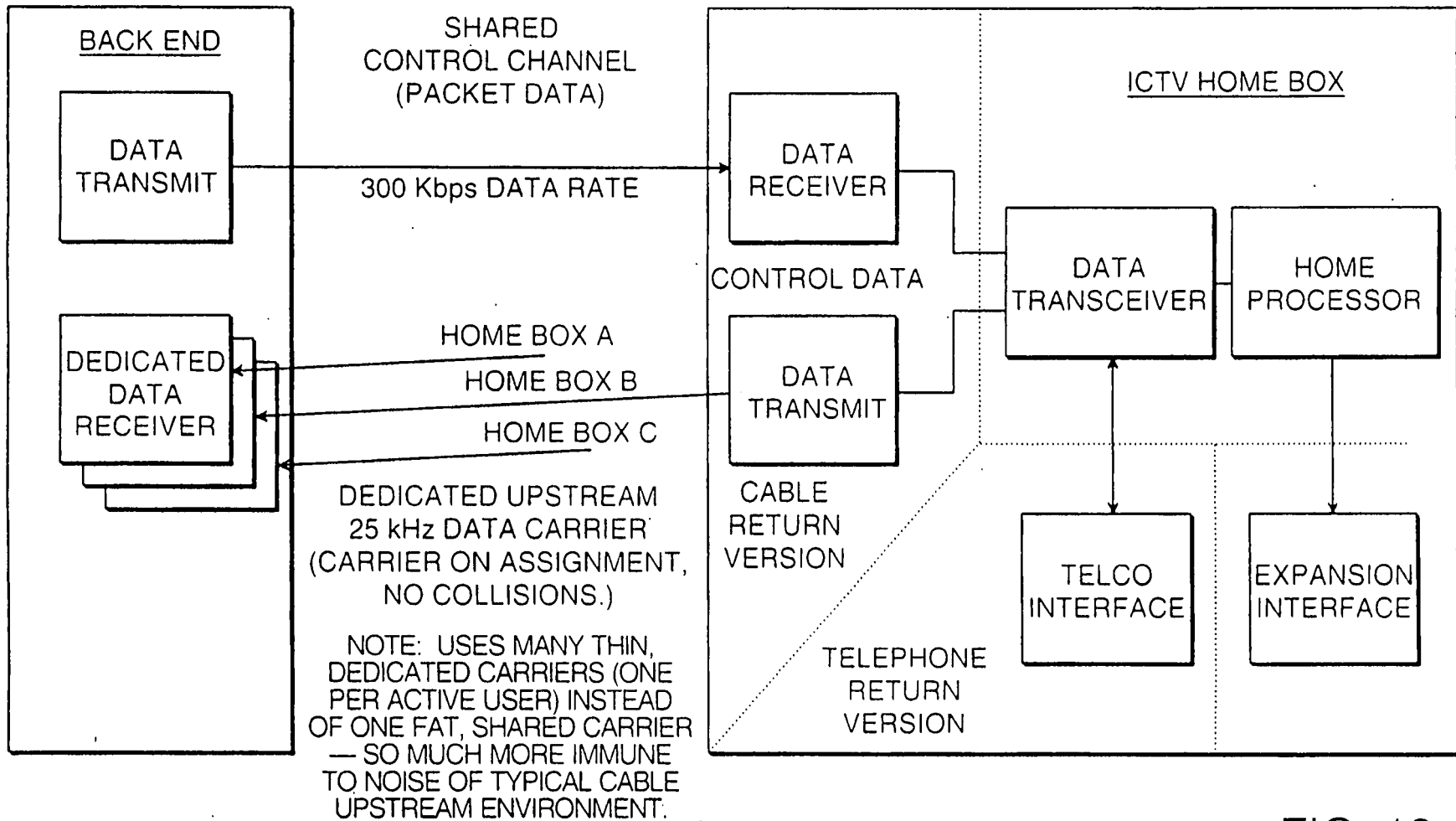


FIG. 13

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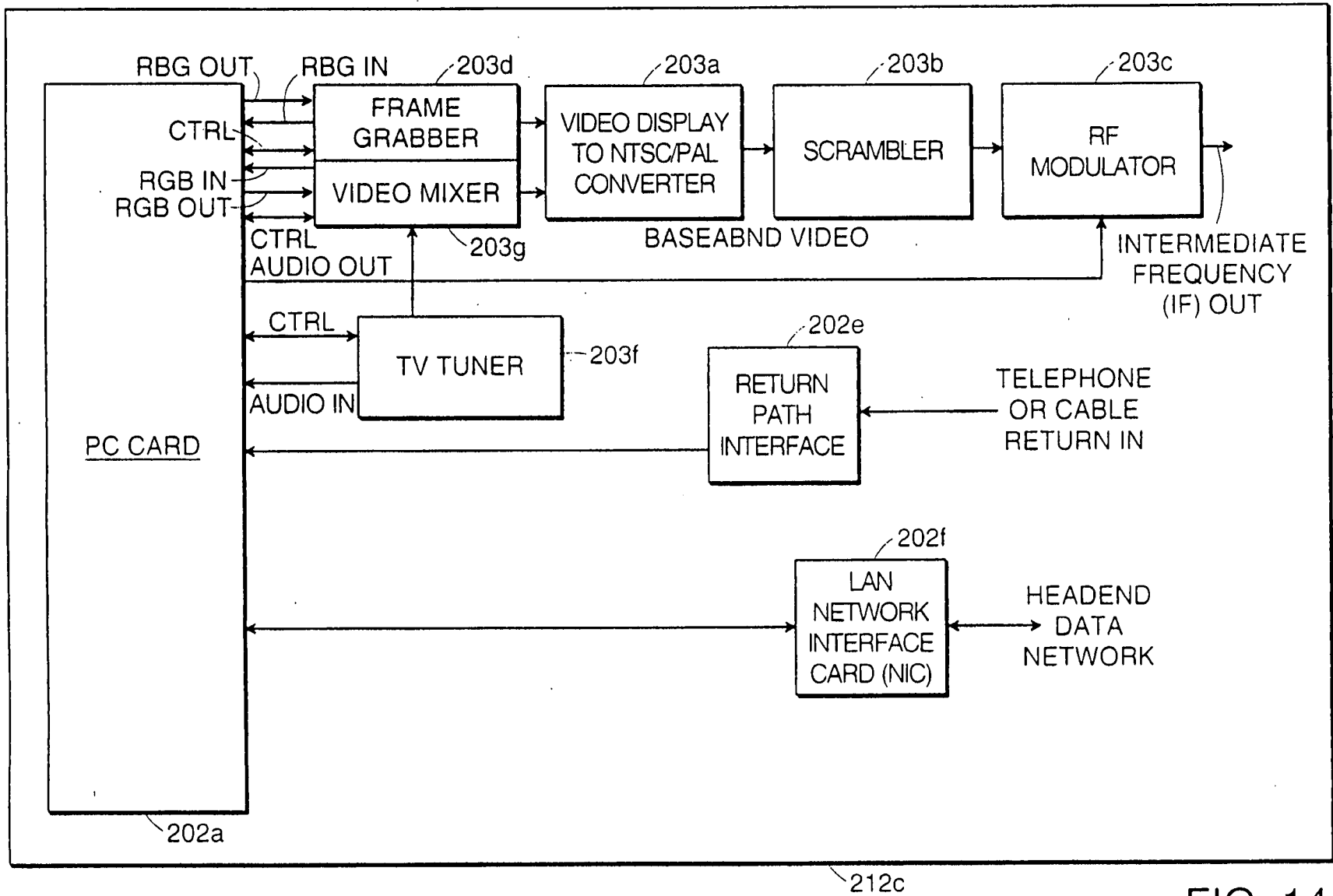


FIG. 14

INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/US 98/25948

A. CLASSIFICATION OF SUBJECT MATTER IPC 6 H04N7/173		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 6 H04N G06K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 27843 A (MULTIMEDIA SYSTEMS CORP) 12 September 1996 see page 2, line 9 - line 19 see page 7, line 26 - page 8, line 12 see page 26, line 19 - page 27, line 11 see page 29, line 20 - line 24 see page 30, line 19 - page 31, line 3 ---	1,2,7,9, 10,15-20
A	DE 44 08 355 A (RICOH KK) 13 October 1994 see column 3, line 47 - line 62 see column 7, line 61 - column 9, line 20 ---	3-5,8, 11,12,21
A	EP 0 643 523 A (ALCATEL BUSINESS SYSTEMS) 15 March 1995 see column 4, line 48 - line 52 see column 8, line 13 - line 28 --- -/--	1,9,17, 19
☒ Further documents are listed in the continuation of box C. ☒ Patent family members are listed in annex.		
* Special categories of cited documents :		
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
Date of the actual completion of the international search 18 March 1999		Date of mailing of the international search report 26/03/1999
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl. Fax: (+31-70) 340-3016		Authorized officer Sindic, G

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/25948

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT.

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 557 316 A (HOARTY W LEO ET AL) 17 September 1996 see column 2, line 34 - column 3, line 13 see column 16, line 66 - column 17, line 10 -----	1,6,9, 14,17,19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/25948

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Application of: Calderone et al.

Docket No.: AGLE0001

JUL 24 2001

Serial No. : 09/785,375

Art Unit: 2644

Filed: February 26, 2001

Examiner: Unassigned

Technology Center 2600

Title: **SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR
VIDEO DELIVERY**

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

This Information Disclosure Statement is submitted:

- (X) under 37 CFR 1.97(b), or
(within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- () under 37 CFR 1.97(c) together with either a:
 - () Certification under 37 CFR 1.97(e), or
 - () a \$220.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)
- () under 37 CFR 1.97(d) together with a:
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 - () a \$220.00 fee under 37 CFR 1.17(d)(2)(ii), and
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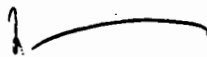
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It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,



Michael Glenn
Attorney For Applicant
Reg. No. 30,176

Customer No. 22862



Form 1029 (Modified) INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use Several Sheets if Necessary)	Atty Docket No. AGLE0001 Applicant: Calderone, et al. Filing Date: 02/16/2001	Serial No.: 09/785,375 Group: 2644

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	A	5,777,571	7/7/98	Chuang	341	176	10/2/96
	B	6,084,572	7/4/00	Yaniger et al.	345	159	5/9/97
	C	6,181,334	1/30/01	Freemen et al.	345	327	7/3/97
	D	6,198,822	3/6/01	Doyle et al.	380	210	3/4/98
	E	6,204,843	3/20/01	Freeman et al.	345	327	10/28/99
	F	6,205,582	3/20/01	Hoarty	725	93	9/18/98
	G	6,215,484	4/10/01	Freemen et al.	345	327	10/28/99
	H	6,225,976	5/1/01	Yates et al.	345	156	10/30/98

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
	I	ACTV Awarded Three Key Digital Television Patents; Coverage Extended to ACTV's Core Technology for Eliminating Video Switching Delay; May 8, 2001; PRNewswire
	J	Sprint Begins Voice-Activated E-Mail; May 23, 1001; Associated Press-New York Times.

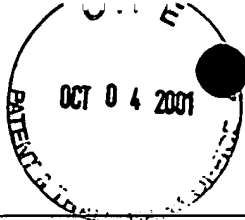
Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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- () Certification under 37 CFR 1.97(e), and
- () a \$220.00 fee under 37 CFR 1.17(d)(2)(ii), and
- () a \$130.00 petition fee set forth in 37 CFR 1.17(i)(1)

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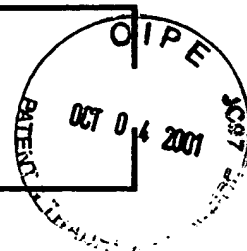
Respectfully Submitted,



Michael Glenn
Attorney For Applicant
Reg. No. 30,176

Customer No. 22862

Form 1449 (Modified) Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)	Atty Docket No. AGLE0001 Applicant: Calderone et al. Filing Date: 2/16/01	Serial No.: 09/785,375 Group: 2644



U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	A	6,192,338	2/20/2001	Haszto et al.	704	257	6/17/1999
	B	6,173,279	1/9/2001	Levin et al.	707	5	4/9/1998

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
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Other Documents

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In re Application of: Calderone et al.

Docket No.: AGLE0001

Serial No. : 09/785,375

Art Unit: 2644

Filed: February 26, 2001

Examiner: Unassigned

Title: **SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR
VIDEO DELIVERY**

INFORMATION DISCLOSURE STATEMENT

Assistant Commissioner for Patents

Washington, DC 20231

Sir:

This Information Disclosure Statement is submitted:

- () under 37 CFR 1.97(b), or
(within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- (x) under 37 CFR 1.97(c) together with either a:
 - (x) Certification under 37 CFR 1.97(e), or
 - () a \$220.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)
- () under 37 CFR 1.97(d) together with a:

- () Certification under 37 CFR 1.97(e), and
- () a \$220.00 fee under 37 CFR 1.17(d)(2)(ii), and
- () a \$130.00 petition fee set forth in 37 CFR 1.17(i)(1)

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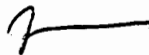
(X) The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 07-1445 (Order No. AGLE0001). A copy of this sheet is enclosed for accounting purposes.

(X) Applicant(s) submit herewith Form PTO 1449 -- Information Disclosure Citation together with copies of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.25.

() A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 156(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on form PTO 1449 and is enclosed herewith.

It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,



Michael Glenn
Attorney For Applicant
Reg. No. 30,176

Customer No. 22862

PATENT



In re Application of: Calderone et al.

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Title: **SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A
WIRELINE NODE OF A NETWORK SUPPORTING CABLE
TELEVISION AND/OR VIDEO DELIVERY**

**CERTIFICATION FOR
INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§1.97(e)**

Commissioner of Patents
and Trademarks
Washington, DC 20231

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Dear Sir:

A certification is being made for the Information Disclosure Statement accompanying this certification.

CERTIFICATION

I, the person signing below, certify

(x) that each item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the statement. (37 CFR 1.97(e)(1))

() that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or to the knowledge of the person signing the certification after making

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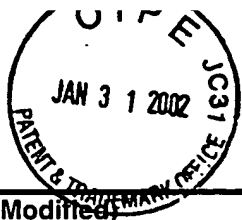
the attorney who signs below on the basis on the information in the attorney's files.

Respectfully submitted,



Michael A. Glenn
Reg. No. 30,176

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Form 1449 (Modified) Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)	Atty Docket No. AGLE0001	Serial No.: 09/785,375
	Applicant: Calderone, et al. Filing Date: 02/16/2001	Group: 2644

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	A	5,446,489	08/29/1995	Egendorf	348	3	01/25/1994

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Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No
	B	0 782 337	07/02/1997	EPO	7	173		X
	C	00/24198	04/27/2000	WIPO	7	173		X

Other Documents

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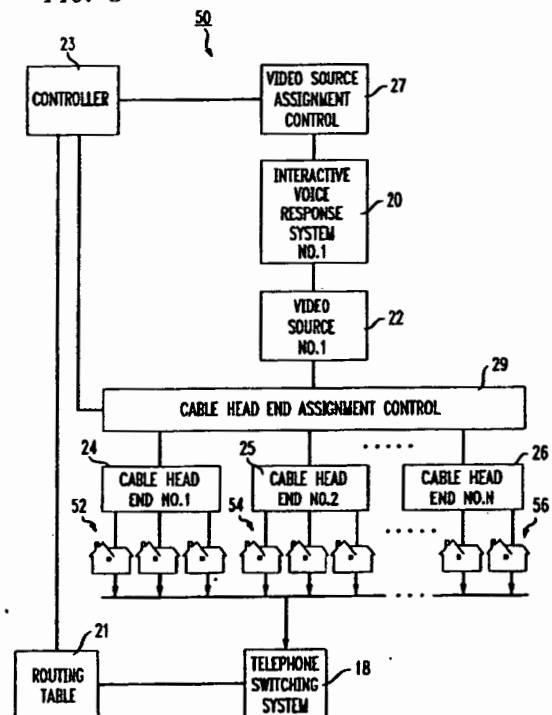
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(54) Demand-adaptive system and method for telephone requested cable programming

(57) A management system and method for use with on-demand cable programming, wherein a customer telephones a cable supplier and requests that a particular video program be played. The management system uses a plurality of video sources, wherein each of the video sources is capable of playing the requested video program. A telephone switch system and routing table are used to route incoming customer requests directly to the interface in control of the video source serving the region from where the request originated. The volume of requests received from each customer region serviced by the cable supplier is evaluated. If the volume of customer requests surpasses a threshold level, then additional video sources are added to the cable network by the cable supplier. The cable head ends that service the various customer regions are then reassigned among the new number of video sources so that the volume of requests is generally evenly divided among the multiple video sources, concurrently, the routing table is changed to maintain the geographic association between customer regions and each appropriate video source.

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to management systems for on-demand cable programming. More specifically, the present invention relates to cable programming management systems that change in response to request demand, whereby a variable number of video sources can be selectively connected to a cable network and allocated to different cable head ends to keep the demand on each video source below a threshold level.

2. Prior Art Statement

Many cable providers offer on-demand programming for movies, music videos and other specialty programming. For movies, the typical prior art approach used by cable providers is to dedicate several cable channels as pay-per-view channels. A different movie is then repeatedly played on each of the pay-per-view channels. If a customer desires to view one of the movies, the customer calls his/her cable provider with the request. The cable provider then enables the customer's cable box to receive the movie at a selected time. Management systems for such prior art programming applications are relatively simple. Since a specific movie is repeatedly played on a dedicated cable channel, the cable provider need only enable a customer's cable box to receive that channel in an unscrambled format. However, since a separate channel must be dedicated to each movie, only a relatively small selection of movies can be offered. Furthermore, on each channel the selected movie is only played at certain times, e.g. at two hour intervals. As such, a customer must wait for the movie start time in order to view the entire movie.

Much more complex programming management systems are used by cable providers that offer true on-demand programming services. Two of the most common on-demand programming services are movie on-demand services and on-demand video jukebox services. Movie on-demand services are typically used by private cable providers, such as hotels and hospitals, that have a relatively small customer base. Conversely, on-demand music video jukebox services are used by many large public cable providers that serve hundreds of thousands of customers. Movie on-demand services used by small private cable providers typically use simple management systems where each request is individually serviced. At one given time, only a small percentage of a hotel's guests or hospital's patients will request a movie. Each guest or patient can therefore be individually accommodated using a relatively small bank of video sources, such as VCRs. However, with on-demand music video jukebox services that are offered by public cable providers, many thousands of

requests may be received in a short span of time. Accordingly, it is not practical to provide individual service to such a large pool of customers.

The video jukebox services offered by many cable suppliers use the same overall management system that is used by a traditional coin operated jukebox. In a traditional coin operated jukebox, there is only one record player. As a person puts money into the jukebox, the selected song is saved in a queue where it is played in the order it was received. With cable supplied video jukebox services, a single cable channel is set aside by the cable supplier for the music videos. Customers are then prompted to call their cable suppliers and request a particular music video. The customer is charged and the requested music video is placed in a queue, where it is played in the order that it was received. Although such a management system seems simple, there are many complications that arise from the large degree of variation that occurs in the number of requests received by a cable supplier in a given period of time. For example, during off-peak hours, only a few requests may be received by a cable supplier. As a result, only a few videos are played on the video jukebox channel. The remainder of the time is occupied by filler material such as commercials or an explanation of services. Since such filler material is typically not interesting to watch, customers change channels. This results in even fewer requests being received and more filler material being aired. Conversely, during peak hours, a cable supplier may be inundated with hundreds of requests. As a result, customers must wait long periods of time before the music video they requested is aired. This causes frustration in the customer, wherein the customer does not believe that he/she is receiving the services for which he/she paid. The customer is therefore much less likely to use the video jukebox services again in the future.

A need therefore exists in the art for a management system that can be applied to on-demand cable programming, wherein the management system is demand responsive and optimizes the organization of cable head ends to provide the requested programming in a time efficient manner.

SUMMARY OF THE INVENTION

The present invention is a management system and method for use with on-demand cable programming, wherein a customer telephones a cable supplier and requests that a particular video program be played. The management system uses a plurality of video sources, wherein each of the video sources is capable of playing the requested video program. A telephone switching system and routing table are used to route incoming customer requests directly to the interface in control of the video source serving the region from where the request originated. The volume of requests received from each customer region serviced by the cable supplier is evaluated. If the volume of customer

requests surpasses a threshold level, then additional video sources are added to the cable network by the cable supplier. The cable head ends that service the various customer regions are then reassigned among the new number of video sources so that the volume of requests is generally evenly divided among the multiple video sources, concurrently, the routing table is changed to maintain the geographic association between customer and each appropriate video source. As such, a variable number of video sources can be selectively coupled to a cable network and allocated to different cable head ends to keep the demand on each video source within a range that is acceptable to the expectations of the customers being served.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference is made to the following description of exemplary embodiments thereof, considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram schematic showing the basic configuration of an on-demand video jukebox service as offered by a local cable supplier;

FIG. 2 is a logic diagram showing the preferred method of operation for the present invention management system;

FIG. 3 is a block diagram schematic showing a preferred embodiment of a Level I management architecture used by the present invention management system;

FIG. 4 is a block diagram schematic showing a preferred embodiment of a Level II management architecture used by the present invention management system; and

FIG. 5 is a block diagram schematic showing a preferred embodiment of a Nth Level management architecture used by the present invention management system.

DETAILED DESCRIPTION OF THE INVENTION

Although the present invention program management system and method can be adapted for use with any customer requested on-demand video programming application, the present invention program management system and method is especially well suited for use in conjunction with a cable provider supplied music video jukebox application. Accordingly, for the purposes of an exemplary embodiment, the present invention program management system and method will be described in conjunction with a cable provider supplied music video jukebox application.

Referring to Fig. 1, a high level block diagram of a

cable provider supplied video jukebox system 10 is shown in accordance with the present invention. In this configuration, a customer turns on the video jukebox channel on his/her television set 12. The television set 12 provides a prompt 14 instructing the customer as to what telephone number must be called to order a specific music video. The telephone call from the customer is received by the cable supplier 16 via a traditional telephone switching system 18, that enables one telephone number to be called by customers regardless of their geographical location. A routing table 21 routes the call to a video source assignment control 27 that is responsive to a central controller 23. As would be understood by a person skilled in the art, video requests may also be made via alternate mediums, for example, on-line from a computer 11 via the Internet, e.g., wherein the geographic location of the user depends on the phone number from which the user calls the Internet access provider. In addition, video requests may be made, for example, directly through the cable network via a cable interface 13.

As will be later explained, the controller 23 evaluates customer demand and directs the video source assignment control 27 to connect the call to an interactive voice response system 20. The interactive voice response system 20 interfaces with a video source 22 supplying a signal being viewed by the caller. The telephone call is responded to at the cable supplier 16 by an interactive voice response system 20, which can be a menu driven system, a voice recognition system, a touch tone automated system or a live operator. As would be understood, automatic number identification (ANI) may also be utilized in the determination of call origin. The interactive voice response system 20 directs a video source 22 to play the customer's selection in the order that the customer's request is received. As will also be explained, the video source 22 is coupled to one of a plurality of cable head ends, via a cable head end assignment control (not shown in FIG. 1). It is common for a cable supplier 16 to utilize a plurality of cable head ends to supply its customers. For the purposes of this disclosure, a cable head end is the smallest, undivided broadcast unit capable of being broadcast by the cable supplier 16, wherein each cable head end must broadcast the same video material on each channel to all the homes connected to the cable supplier 16 via that cable head end.

Referring to Fig. 2, a general schematic showing the overall operation of an advantageous embodiment of the present invention system and method is shown. The present invention system and method uses a plurality of progressive management architectures in order to respond to increasing degrees of customer demand. The first level management architecture is the simplest in complexity and is intended for use during off-peak periods where customer demand is low. Subsequent level management architectures are progressively more complex in response to growing customer demand, wherein alternate video environments are replicated

and customer calls are routed to match the video programming in the alternate video environments.

In the shown embodiment of Fig. 2, a plurality of separate management architectures are used in response to changes in customer demand. As will be understood, the use of three separate management architectures specifically shown in Fig. 2 is merely exemplary and any plurality of progressively complex management architectures can be used. As indicated by the first block 32 in Fig. 2, the present invention system 30 first assumes that customer demand is low and therefore assumes a Level I management architecture. As will be later explained, a Level I management architecture uses a single video source, wherein all the cable head ends used by the cable supplier are coupled to the single video source.

As is indicated by the second block 34, third block 36 and fourth block 38 in Fig. 2, the level of customer demand is evaluated by the present invention system and method 30. If the level of demand exceeds a threshold value for the Level I management architecture, then a Level II management architecture is assumed, as indicated by block 40. If the level of demand exceeds a threshold value for the Level II management architecture, then a Level III management architecture is assumed, as indicated by block 42. As will later be explained, the Level II management architecture uses two video sources while the Level III management level uses N video sources. As indicated by block 39 and 44 subsequent levels can be used in alternate embodiments, wherein the number of the level corresponds to the number of video sources used by that level. The level of the management architecture can be increased to a level corresponding to the number of cable head ends used by the cable supplier 16, wherein each cable head end is serviced by its own video source. The change between management architecture levels is entirely dependent upon customer demand. As a result, the change in management architecture levels need not be sequential, and a Level I management architecture can change directly into any other management architecture level and vice versa.

Referring to Fig. 3, an advantageous embodiment of the Level I management architecture 50 is shown. In this embodiment, a cable supplier broadcasts over some finite number of cable head ends 24, 25, 26. Each of the cable head ends 24, 25, 26 supplies a corresponding customer region 52, 54, 56, respectively. Customers telephone requests from the various customer regions 52, 54, 56. The telephone requests are received by the cable supplier via the telephone switching system 18. The routing table 21 is capable of identifying incoming calls by the customer region 52, 54, 56 from which the telephone call originated. In connection with the controller, the routing table is updated to maintain the geographic association between customer regions and each appropriate video source. However, in the low demand Level I management architecture 50 such source addressing is unnecessary. The controller 23

evaluates demand and assumes the appropriate level management architecture for the demand. In the shown Level I management architecture 50, demand is low and only one interactive voice response system 20 and one video source 22 are used. Consequently, the controller 23 directs the video source assignment control 27 to direct all incoming calls to the sole interactive voice response system 20. The telephone calls are then answered by the interactive voice response system 20 that enters the customer selection into the queue of the single video source 22. Since demand is low and the controller 23 is recognizing a Level I management architecture 50, the controller 23 instructs the cable head end assignment control 29 to assign all of the cable head ends 24, 25, 26 to the single video source 22. Consequently, the signal from the single video source 22 is broadcast out to all the cable head ends 24, 25, 26 and is thus received by all the customer regions 52, 54, 56.

The Level I management architecture 50 of Fig. 3 represents the simplest management architecture where one video source 22 and one interactive voice response system 20 are capable of servicing the entire customer demand from all of the customer regions 52, 54, 56. Since only one video source 22 and one interactive voice response system 20 are being used, all request calls regardless of origin, or cable head end service are added to the queue of the single video source 22.

Since the Level I management architecture 50 embodied by Fig. 3 only has one interactive voice response system 20 and only one video source 22, the purpose of the routing table 21 and controller 23 are not immediately apparent. As will be later explained, the routing table 21 and controller 23 serve more apparent functions in higher level management architectures, where multiple video sources and interactive voice response systems are used.

When the controller 23 recognizes that customer demand has surpassed certain threshold levels, the present invention system changes from a Level I management architecture to a subsequent level management architecture. The threshold level evaluated by the controller 23 can be dependent upon many variables but is preferably dependent upon the size of the queue created by customer requests. For example, if there are less than twenty customer requests per hour, the present invention system may remain in a Level I management architecture. However, if the queue of customer requests grows to be between twenty and forty requests per hour, a Level II management architecture may be embodied. For a queue of customer requests of between forty and sixty requests per hour, a Level III management architecture would be used. Such threshold levels are merely exemplary and any alternative values can be used by a cable supplier. The higher the threshold level, the larger the queue for any one given video source. As a result, a large threshold may result in a customer having to wait a long time to see the video

that he/she ordered. The setting of the appropriate threshold level for a given time, day and date is therefore a business decision that is made by the cable supplier. As would be understood, the threshold levels for transitioning between levels may have a hysteresis band to avoid unstable "hunting" behavior between levels.

Referring now to Fig. 4, a preferred embodiment of a Level II management architecture 70 is shown. When customer demand surpasses the threshold value assigned to the Level I management architecture, a single video source is incapable of playing all the customer requests in the queue within a reasonable period of time. As such, a second video source 72 is used in conjunction with the original first video source 22. A second interactive voice response system 74 is assigned to the second video source 72. As can be seen from Fig. 4, once a cable supplier assumes a Level II management architecture 70, the video source assignment control 27 has the task of directing the incoming telephone calls to either the first interactive voice response system 20 or the newly introduced second interactive voice response system 74. Furthermore, the cable head assignment control 29 has the task of assigning different cable head ends 24, 25, 26 to either the first video source 22 or the second video source 72.

The controller 23 directs the operation of the video source assignment control 27 and the cable head end assignment control 29. In regard to the operation of the cable head end assignment control 29, the decision as to which of the cable head ends 24, 25, 26 is assigned to which of the two video sources 22, 72 is dependent upon demand. The assignments are preferably made to balance the request queue between the two video sources 22, 72. The controller 23 evaluates the volume of calls received by the routing table 21. Since the routing table distinguishes the incoming calls by their customer region of origin, the controller 23 is capable of evaluating the demand generated by each of the customer regions 52, 54, 56 served by the various cable head ends 24, 25, 26. Depending upon how many calls are being received from the various customer regions 52, 54, 56, the controller 23 instructs the cable head end assignment control 29 to assign the cable head ends 24, 25, 26 to either the first video source 22 or the second video source 72 in a manner that divides the request queue to be most even. As a result, if one customer region 56 is generating a disproportionate amount of requests, it is possible that only the cable head end 26 serving that customer region 56 would be assigned to the second video source 72. Conversely, if the customer demand is relatively even across the various customer regions 52, 54, 56, then the controller 23 will divide the cable head ends 24, 25, 26 approximately evenly between the first video source 22 and the second video source 72.

After the controller 23 has instructed the cable head end assignment control 29 to assign the different cable head ends 24, 25, 26 to the two video sources 22, 72,

the incoming calls are also separated between the two interactive voice response systems 20, 72. Telephone calls received by the telephone switching system 18 are distinguished by the routing table 21 by the customer region of origin. As mentioned, the routing table is changed based on input from the controller to maintain the geographic association between customer regions and each appropriate video source. Request calls received from customers served by the cable head ends 24, 25 assigned to the first video source 22, are directed to the interactive voice response system 20 for the first video source 22. Similarly, request calls received from customers served by the cable head ends 26 assigned to the second video source 72, are directed to the interactive voice response system 74 for the second video source 72. Consequently, request calls are sorted by the customer region from which the request calls originate and are then forwarded to the interactive voice response system for the video source that serves that customer region.

Referring to Fig. 5, a preferred embodiment of an Nth Level management architecture 80 is shown. During peak periods, it is possible that neither one nor two separate video sources would be sufficient to serve the customer request queue in a reasonable amount of time. In such a circumstance, at least one subsequent video source must be used. In the exemplary embodiment of Fig. 5, an Nth Level management architecture 80 is shown having at least one subsequent video source 82 and a corresponding number of subsequent interactive voice response systems 84.

As with the Level II management architecture, when the controller 23 evaluates demand and assumes an Nth Level management architecture 80, the different cable head ends 24, 25, 26 are assigned to the first video source 22, second video source 72 and subsequent video sources 82, respectively, by the cable head end assignment control 29. The decision as to which cable head end 24, 25, 26 is assigned to which of the video sources 22, 72, 82 is made by the controller 23 and is again dependent upon customer demand. Cable head end assignments are preferably made to balance the customer request queue among the multiple video sources 22, 72, 82. By balancing the customer request queue, a customer would have to wait the least amount of time to view the music video that he/she ordered.

The routing table 21 identifies the customer region origin of the telephone calls received by the telephone switching system 18. Depending upon how many calls are being received from the various customer regions 52, 54, 56, the controller 23 instructs the cable head end assignment control 29 to assign the various cable head ends 24, 25, 26 to one of the N video sources 22, 72, 82 in a manner that approximately evenly divides the customer request queue. After the cable head ends 24, 25, 26 have been assigned to the various video sources 22, 72, 82, the controller 23 directs the video source assignment control 27 to direct customer request calls, received from the various customer regions 52, 54, 56,

to the appropriate interactive voice response system 20, 74, 84. Customer request calls received from customer regions assigned to the subsequent video sources 82 are directed to the interactive voice response systems 84 that serves the subsequent video sources 82. Likewise, customer request calls received from the customer regions assigned to the first video source 22 and the second video source 72 are directed to the interactive voice response systems 20, 74 that serve those video sources, respectively.

The number of video sources used by the present invention system can be increased up to the number of cable head ends used by the cable supplier. For instance, if a cable supplier has one hundred cable head ends, then that cable supplier can increase the number of video sources to one hundred so that each cable head end is serviced by its own video source and interactive voice response system. As would be understood, the controller and routing table are not limited to a single cable supplier.

That is, the controller and routing table may operate in connection with a number of different cable providers in order to provide maximum efficiency for the video jukebox system.

Accordingly, the controller need not be located within the confines of a cable supplier, as would be understood.

As customer demand falls, the number of video sources decreases to a minimum of one. Transitions between one video source and multiple video sources can be synchronized to occur at the dead space at the end of a music video or in between commercials or other fill material. As a result, a person watching the video jukebox channel will not be able to detect when his/her customer region has been allocated to a different video source.

It will be understood that the embodiments of a present invention specifically described are merely exemplary and a person skilled in the art can make alternate embodiments, modifications and alterations to the embodiments described. All such embodiments, modifications and alterations are intended to be included in the scope of the present invention as set forth by the appended claims.

Claims

1. In a cable broadcasting network having a plurality of cable head ends for supplying separate customer regions, a demand adaptive system for managing requested programming from the separate customer regions, said system comprising:

a plurality of video sources capable of playing the requested programming, wherein said plurality of video sources includes a first video source connected to the cable broadcasting network and at least one subsequent video source capable of being selectively connected

to said cable broadcasting network;

demand evaluation means for evaluating the requested programming and determining whether the requested programming exceeds a threshold level, wherein said at least one subsequent video source is added to said cable broadcasting network when the requested programming surpasses said threshold level; and assignment means for assigning each of said cable head ends to one of said video sources connected to said cable broadcasting network, wherein the requested programming for each of said video sources is maintained below said threshold level.

2. The system according to Claim 1, further including a response means for receiving and responding to requests from customers serviced by one of said cable head ends and directing one of said video sources to play the requested programming.
3. The system according to Claim 2, wherein said requests are telephone requests and said system further including telephone switching means for automatically directing the telephone requests received from customers serviced by one of said cable head ends to the response means that directs one of said video sources assigned to that one of said cable head ends.
4. The system according to Claim 1, wherein said demand evaluation means further controls the removal of said at least one subsequent video source from said cable broadcasting network when the requested programming falls below a minimum level.
5. The system according to Claim 1, wherein said plurality of video sources is equal in number to said plurality of cable head ends.
6. The system according to Claim 2, wherein said assignment means assigns each of said cable head ends to one of said video sources connected to said cable broadcasting network in a manner so that the requests received by the response means for each of said video sources are generally equal.
7. The system according to Claim 1, wherein said at least one subsequent video source is configured to include a plurality of subsequent video sources.
8. The system according to Claim 7, wherein said demand evaluation means adds one of said subsequent video sources to said cable broadcasting network each time the requested programming for one of said video sources already connected to said cable broadcasting network surpasses said threshold level.

9. The system according to Claim 7, wherein said demand evaluation means removes one of said subsequent video sources from said cable broadcasting network each time the requested programming for one of said video sources falls below a minimum level. 5
10. A video jukebox management system for use by a cable supplier that broadcasts on-request video program services across multiple cable heads, said system comprising: 10
 - a plurality of video sources, wherein each of said video sources is capable of playing a requested video program; and 15
 - control means for selectively assigning each of said cable head ends to one of a number of said video sources, wherein the number of video sources is dependent upon the amount of video requests received by the cable supplier within a period of time. 20
11. The system according to Claim 10, further including a telephone call response means, associated with each one of said video sources, for instructing a video source coupled thereto to play a particular video program in response to a telephone request. 25
12. The system according to Claim 11, further including a telephone call directing means for directing telephone requests from customers serviced by said cable head ends to the telephone call response means associated with said video sources, wherein said telephone directing means is capable of determining an area corresponding to one of said cable head ends from which each telephone request originates and forwards each telephone request to the telephone call response means that directs one of said video sources connected to the one of said cable head ends that services said area. 30
13. The system according to Claim 10, wherein each of said cable head ends serves a predetermined customer region and the cable supplier receives a variable amount of telephone requests from each said predetermined customer region, and wherein said control means selectively assigns cable head ends to said video sources in a manner so that each of said video sources services an overall customer region that generates a generally equal amount of telephone requests. 35
14. The system according to Claim 10, wherein said control means adds an additional video source to said cable head ends each time the amount of video requests for one of said video sources already assigned to one of said cable head ends surpasses a threshold value. 40
15. The system according to Claim 14, wherein said control means disconnects a video source from said cable head ends each time the amount of video requests for one of said video sources already assigned to one of said cable head ends falls below a minimum value. 45
16. A method of supplying on-request video program services to a cable system having multiple cable head ends, wherein each of said cable head ends services a customer region, said method comprising the steps of: 50
 - providing a plurality of video sources, wherein each of said video sources is capable of playing a requested video program;
 - connecting each of said cable head ends to one of a number of said plurality of video sources; and
 - varying said number of video sources in response to customer demand.
17. The method according to Claim 16, further including the step of assigning each of said cable head ends to one of said number of video sources in a manner so that the customer demand for each of said number of video sources is generally equal.
18. The method according to Claim 16, further including the step of directing customer requests from each said customer region to the one of said video sources that services that customer region.
19. The method according to Claim 16, further including the step of assigning all of said cable head ends to a single video source when customer demand falls below a level.
20. The method according to Claim 16, wherein said step of varying the number of video sources includes adding a subsequent video source each time the customer demand on one of said video sources surpasses said threshold level.
21. The method of Claim 16, wherein customer demand for each of said video sources is maintained below a threshold level.
22. The system according to Claim 2, wherein said requests are on-line requests and said system further includes switching means for automatically directing the on-line requests received from customers serviced by one of said cable head ends to the response means that directs one of said video sources assigned to that one of said cable head ends. 55
23. The system according to Claim 1, wherein said cable broadcasting network includes multiple cable

providers, said demand evaluation means and said assignment means being operable in connection with more than one of said cable providers.

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FIG. 2.

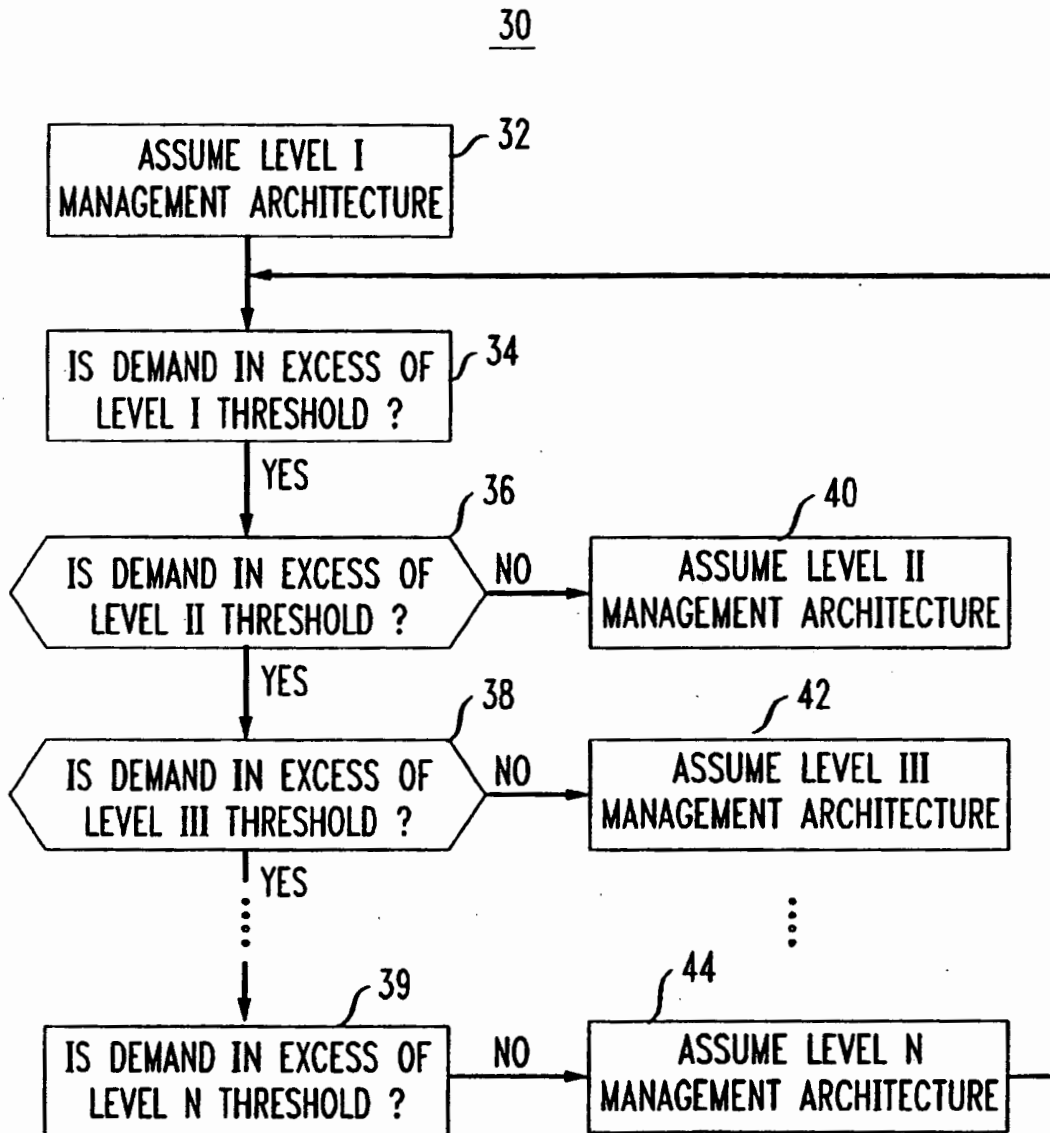


FIG. 3

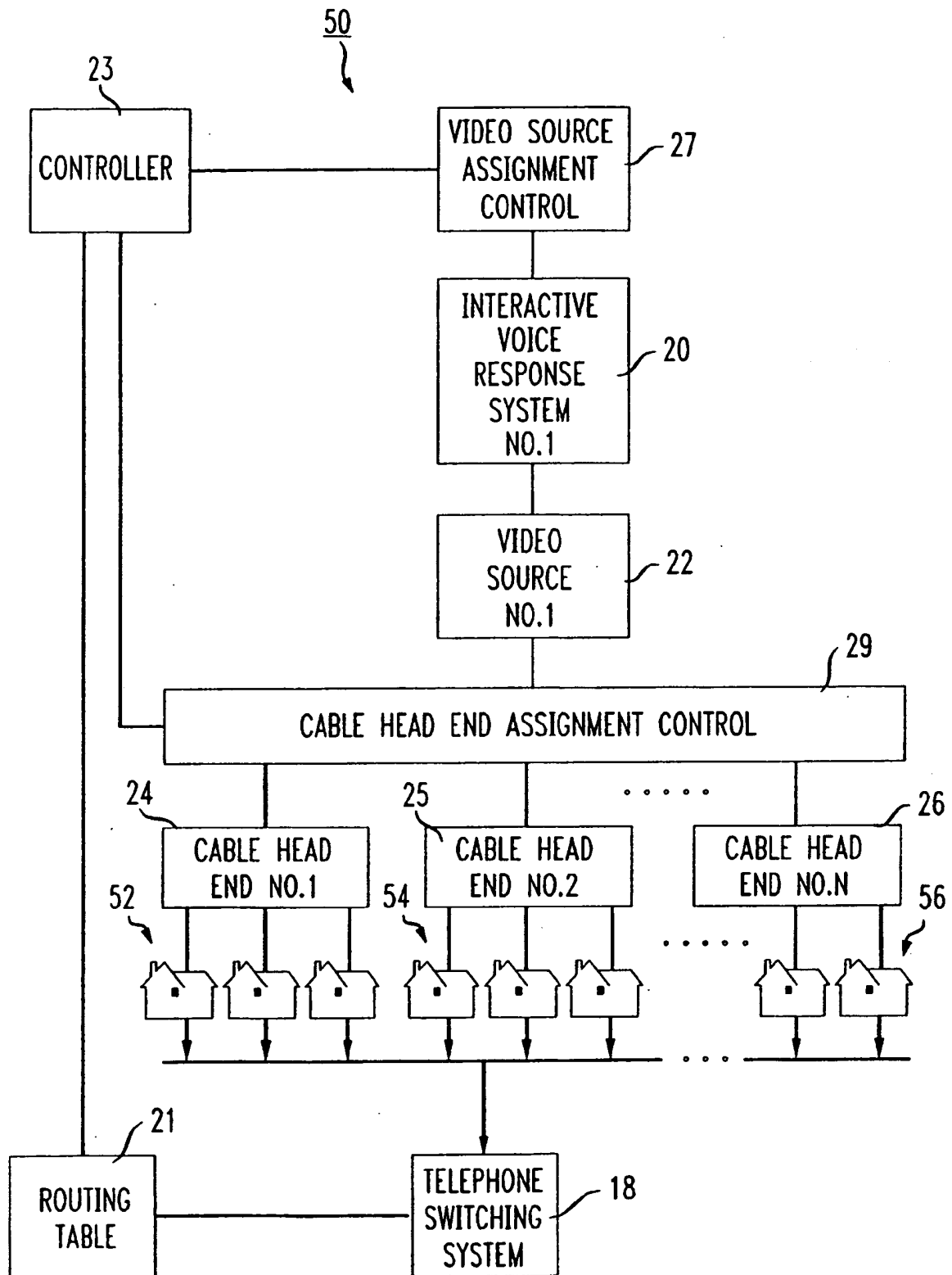


FIG. 4

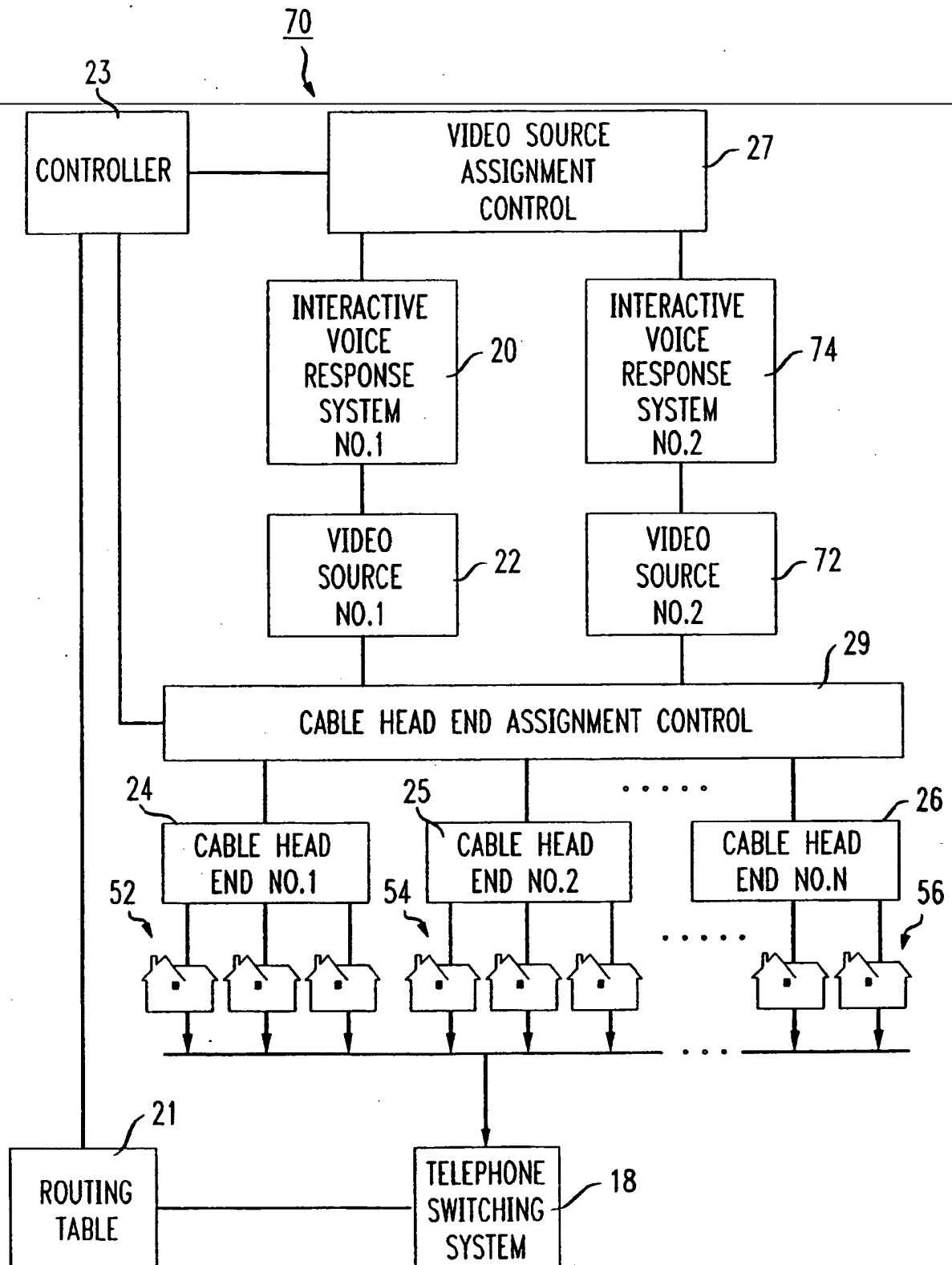
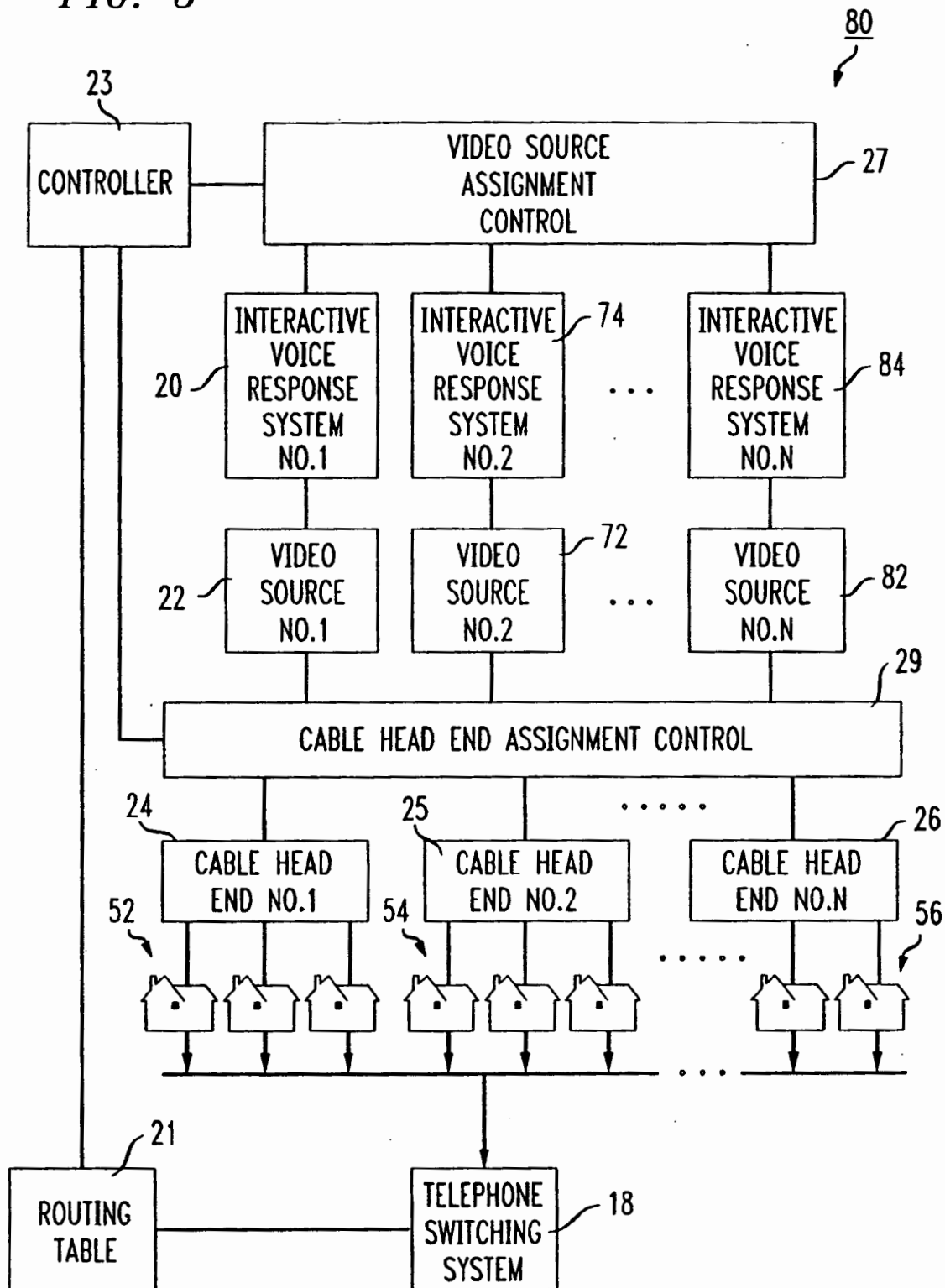


FIG. 5



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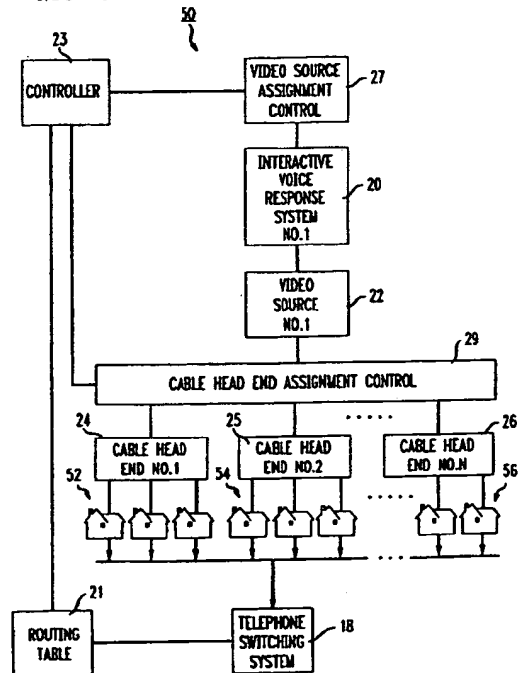
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(54) Demand-adaptive system and method for telephone requested cable programming

(57) A management system and method for use with on-demand cable programming, wherein a customer telephones a cable supplier and requests that a particular video program be played. The management system uses a plurality of video sources, wherein each of the video sources is capable of playing the requested video program. A telephone switch system and routing table are used to route incoming customer requests directly to the interface in control of the video source serving the region from where the request originated. The volume of requests received from each customer region serviced by the cable supplier is evaluated. If the volume of customer requests surpasses a threshold level, then additional video sources are added to the cable network by the cable supplier. The cable head ends that service the various customer regions are then reassigned among the new number of video sources so that the volume of requests is generally evenly divided among the multiple video sources, concurrently, the routing table is changed to maintain the geographic association between customer regions and each appropriate video source.

FIG. 3

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European Patent
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Application Number
EP 96 12 0791

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	GB 2 289 600 A (NIPPON ELECTRIC CO) 22 November 1995	1,10,16	H04N7/173
A	* page 2, line 16 - page 3, line 7 *	2-9, 11-15, 17-23	
Y	FR 2 682 509 A (BOULET ET AL) 16 April 1993 * abstract *	1,10,16	
A	* page 3, line 30 - line 37 *		
A	IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, vol. 13, no. 5, 1 June 1995, pages 779-787, XP000499086 NUSSBAUMER J -P ET AL: "NETWORKING REQUIREMENTS FOR INTERACTIVE VIDEO ON DEMAND" * the whole document *	1-23	
A	IEEE TRANSACTIONS ON COMMUNICATIONS, vol. 39, no. 8, 1 August 1991, pages 1268-1274, XP000264287 TAK-SHING P YUM: "HIERARCHICAL DISTRIBUTION OF VIDEO WITH DYNAMIC PORT ALLOCATION" * the whole document *	1-23	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04N
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 14 August 1997	Examiner Greve, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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(21) International Application Number: PCT/US99/24710 (22) International Filing Date: 19 October 1999 (19.10.99) (30) Priority Data: 09/176,611 21 October 1998 (21.10.98) US (71) Applicant: OPENTV, INC. [US/US]; 401 E. Middlefield Road, Mountain View, CA 94043-4005 (US). (72) Inventor: DUREAU, Vincent; 3519 South Court, Palo Alto, CA 94306 (US). (74) Agent: BERRIER, Mark, L.; Conley, Rose & Tayon, P.C., P.O. Box 398, Austin, TX 78767-0398 (US).	(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(54) Title: AN INTERACTIVE TELEVISION SYSTEM AND METHOD FOR CONVERTING NON-TEXTUAL INFORMATION TO TEXTUAL INFORMATION BY A REMOTE SERVER		
(57) Abstract A system and method for providing user input to an application executing on an interactive television system wherein a user provides non-textual information to the interactive television system and this information is converted by a server to textual information which is provided to the application. In one embodiment, a digitizer pad coupled to a set-top box is used to digitize the user's handwriting. The digitized information is conveyed to a remote server which converts the digitized handwriting data into textual information. The textual information is conveyed to the set-top box, where it is input to an application executing on the set-top box. In another embodiment, a microphone is coupled to a set-top box. The microphone allows the user to input voice information which is digitized and conveyed to the server for conversion into textual information. The textual information is conveyed back to the set-top box and is input to an application executing on the set-top box. <pre> graph TD 61[START APPLICATION 61] --> 62[PROMPT USER 62] 62 --> 63[INPUT HANDWRITING 63] 63 --> 64[TRANSFER HANDWRITING DATA 64] 64 --> 65[RECOGNIZE HANDWRITING 65] 65 --> 66[TRANSFER TEXTUAL DATA 66] 66 --> 67[UTILIZE TEXTUAL DATA 67] </pre>		

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TITLE: AN INTERACTIVE TELEVISION SYSTEM AND METHOD FOR CONVERTING NON-TEXTUAL INFORMATION TO TEXTUAL INFORMATION BY A REMOTE SERVER

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BACKGROUND OF THE INVENTION

1. **Field of the Invention**

The invention relates generally to interactive television systems and more particularly to means and methods for using a server to convert user-provided information into a data format which can be used by an interactive television application.

2. **Description of the Relevant Art**

Interactive television systems can be used to provide a variety of services to users. These systems are capable of displaying text and graphic images to facilitate viewer interaction as well as the audio and video streams associated with ordinary television programs. Interactive television systems enable viewer interaction and thereby allow the systems to be used for marketing and educational purposes in addition to extending the entertainment capabilities of an ordinary television. Viewers can order advertised products or services, request information regarding particular programs, or send electronic messages (e-mail).

In a typical interactive television system, a broadcast service provider generates an interactive television signal for transmission to a viewer's television. The interactive television signal includes an audio-video portion consisting of a television program, as well as an interactive portion consisting of application code or control information. The broadcast service provider combines the audio-video and interactive portions into a single signal for transmission to a receiver connected to the user's television. The signal is typically compressed prior to transmission and transmitted through broadcast channels such as cable television (CATV) lines or direct satellite transmission systems.

The interactive functionality of the interactive television system is controlled by a set-top box connected to the television. The set-top box receives the signal transmitted by the broadcast service provider, separates the interactive portion from the audio-video portion and decompresses the respective portions of the signal. If the interactive portion of the signal comprises an interactive application, the application may be executed while the audio-video information (the normal television signal) is conveyed to the television. The set-top box may combine the audio-video information with interactive graphics or audio generated by the interactive application prior to conveying the information to the television. The interactive graphics and audio may present additional information to the viewer or may prompt the viewer for input and may be designed to function in response to signals in the broadcast or actions taken by the viewer. An interactive television system may also run applications that present the user only with the audio and graphics relating to the interactive application. In other words, this information may be displayed in place of the normal television signal, rather than adding to the signal.

There are various examples of interactive applications which require viewer input. One example is a televised buying service in which a series of products are displayed via a television program and the viewer utilizes the interactive functions of the television system to purchase the displayed products. The viewer must

information descriptive of the product. This information may be provided by selecting the appropriate choice from a menu. The application may, however, also require the user's name or shipping information which cannot simply be selected from a menu. Another example of an application which requires textual information is a messaging application for which the viewer must provide the message, as well as information identifying the addressee of the message. Some means is therefore necessary to enter this textual information.

One option for entering text would be to use a keyboard. This might not be the best solution, however, because some users may not feel comfortable using a keyboard. One of the attractions of interactive television systems is the ease with which they may be used. Interactive television applications are designed to provide simplified user interfaces and many require no more input than can be provided using a basic remote control.

The requirement of entering textual information via a keyboard may make the interactive television system less attractive to users because of the additional hardware which is required for the system, the perceived complexity of the system or the difficulty which may be experienced by some users in typing the necessary information. Further, in some languages (e.g., Chinese,) the complexity of the written language makes text entry via a keyboard difficult even for experienced users.

Other options for providing textual information to an application may involve means for converting non-textual information into a textual form. For example, using voice recognition technology, a user's voice can be sampled and compared to previously sampled speech patterns to determine the words spoken by the user. The words can then be output by the speech recognition system as text. Handwriting recognition systems could also be used to generate textual information for the application. These systems perform the same process on images of the user's handwriting (entered via a graphics tablet or similar input device) to determine the text written by the user. While these technologies have evolved to the point that they can reliably generate accurate textual information from the user's voice or handwriting, they require a great deal of computer resources. The applications may be very large and they need large amounts of processing time to perform the required pattern matching. These technologies therefore cannot be implemented in current set-top boxes, which have very limited storage and processing capacity.

SUMMARY OF THE INVENTION

One or more of the problems outlined above may be solved by the various embodiments of the invention. The invention comprises a system and method for enabling a user to provide non-textual information which is converted by the system to a textual form in which it can be used by the interactive application. The non-textual information is entered by the user at the set-top box of a receiving station and this information is transmitted to a server which may be located at a broadcast station. The server converts the information into textual data so that it can be used by the system. In one embodiment, the server transmits the textual data back to the receiving station, where it can be used by an application executing in the set-top box. In other embodiments, the textual data can be used at the server or transmitted to a part of the system other than the set-top box.

One embodiment comprises an interactive television system comprising a broadcast station and a receiving station. The broadcast station transmits an interactive television application to the receiving station, which then executes the application. The application requires textual data from the user. The receiving station

includes a set-top box which executes the application and a graphics tablet which is coupled to the set-top box for entering information. The user provides the information by writing on the graphics tablet, which generates an image file. The image file is transmitted from the set-top box to the broadcast station. The broadcast station includes a server which uses handwriting recognition software to convert the image file into character or textual data. The textual data is transmitted back to the application at the set-top box, which uses the data as if it had been typed in directly by the user.

Because the handwriting recognition software resides on the server computer instead of the set-top box, more resources are available for execution of the software. The server typically has more available memory and more processing power than the set-top box and consequently provides much faster recognition of handwriting images. The greater available resources enable the software to provide for recognition of additional, complex languages (e.g., Chinese) and extended character sets (e.g., unicode). Since the recognition software is maintained on the server, the software can be quickly and easily updated with the latest handwriting recognition technology, and it does not have to be distributed to the individual subscribers' set-top boxes.

In one embodiment, the textual data need not be sent back to the set-top box, but may instead be used at the server or another location remote from the set-top box. For example, a user may place an order for a product by entering oral or handwritten information and the order may be confirmed later by e-mail or other means. In another embodiment, the server could consist of a human operator who receives the audio or image data and manually transcribes it into textual information. The audio or image data may alternately be converted into textual information by automated means operating under human supervision.

In an alternate embodiment, the interactive television system includes a microphone rather than a graphics tablet for entry of information to the system. The microphone is used to provide voice data, which is recorded and transmitted to a server equipped with a voice recognition application. The voice recognition application converts the voice data into textual data, which is then transmitted back to the application executing on the set-top box.

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BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the accompanying drawings in which:

Fig. 1 is a block diagram illustrating one embodiment of a system for distribution of interactive television applications and television programs from their sources to a series of viewers.

Fig. 2 is a block diagram of a set-top box in one embodiment of the invention.

Fig. 3 is a block diagram illustrating the components of a graphics tablet in one embodiment of the invention.

Fig. 4 is a flow diagram illustrating the flow of handwritten/textual information in one embodiment of the invention.

Fig. 5 is a flow diagram illustrating the manner in which the server's handwriting recognition application processes the image data to produce textual data in one embodiment of the invention.

While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It

should be understood, however, that the drawing and detailed description thereto are not intended to limit the invention to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the present invention as defined by the appended claims.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One embodiment of the inventive method is described in detail below. In this embodiment, an interactive television system transmits an audio-video-interactive signal from a broadcast station to a receiving station via a broadcast channel. ("Broadcast" is used herein to refer to transmission of a single signal to all
10 subscribing receivers.) The broadcast channel may comprise a direct satellite transmission channel or any known means for broadcasting a signal, including non-satellite, cable, telco, MMDS (microwave) and terrestrial transmissions. (A "direct" satellite transmission as used herein means a transmission received by the interactive television receiver directly from the satellite.). The receiving station in this embodiment is additionally configured to receive signals via a modem connection to the broadcast station.

15 The audio-video-interactive signal broadcast to the receiving station may contain both television programming and interactive information such as control signals or interactive applications. When the broadcast signal is received, it is separated into its components and processed (e.g., decompressed) to reconstruct the respective television programming and interactive signals. An interactive application which was broadcast to the receiving station or which was resident in the receiving station is executed on the
20 microprocessor of the set-top box. The application is one which requires textual data from the user. The user, however, is allowed to input the data in a non-textual form. "Non-textual" as used herein means a form handled by the system as something other than a series of alphanumeric characters, such as the ASCII character set. A graphical representation of handwriting, although textual in nature, is handled as an image or as vectorized handwriting information and not as the characters or words which are written. "Textual," on the other hand,
25 means one or more characters or words. If the system is set up for an English-speaking user, the characters may be from the ASCII character set. If the system is set up for a non-English-speaking user, the characters will be from the character set of the user's language (e.g., Kanji characters for a Japanese user).

The set-top box of the receiving station is configured with a device for non-textual data entry. In one embodiment, this device is a graphics tablet on which the user can inscribe (write) the information required by
30 the application. The graphics tablet digitizes the user's handwriting and stores the digitized data as an image file. The set-top box transmits the file containing the digitized data to the broadcast station for conversion into a textual form. (The image data need not all be contained in a single file, and may be transmitted to the server in segments to spread out the processing load.) The broadcast station includes a server which is configured to transform image data into textual data using handwriting recognition algorithms. The broadcast station then
35 transmits the textual data back to the receiving station. The application executing on the set-top box identifies the received textual data as corresponding to the image data which it earlier transmitted to the broadcast station. The set-top box accordingly utilizes the textual data as if it had been entered as text by the user of the set-top box and continues execution of the interactive television application.

Referring to Fig. 1, a block diagram illustrating a system for distribution of interactive television applications and television programs from their sources to a series of viewers is shown. Broadcast station 10 has a television program source 11 and an interactive application source 12. The television program source may include remote broadcast network feeds, videotape recorders, computers, data storage devices, and the like.

5 Interactive application sources 12 may provide interactive applications, control information or audio or video information which is to be included in the interactive television signal. Additionally, broadcast station 10 includes a server 13, which is used to process non-textual data received at the broadcast station and generate textual data. The information generated by the television program source 11, interactive application source 12 and server 13 is typically processed by compression/packetization units 14-16 before it is broadcast. Usually,

10 the information is also compressed in order to conserve bandwidth. (It should be noted that while this embodiment comprises a digital broadcast system, other embodiments may comprise analog broadcast systems in conjunction with means for transmitting digital application data. The analog broadcast systems may include existing television networks, and the means for transmitting the application data may include transmissions in the vertical blanking interval or parallel transmissions via telephone lines or out-of-band cable signals.)

15 Any of a number of compression algorithms, such as one of the Motion Picture Expert Group (MPEG) compression standards, may be used if appropriate for a particular program or application. The information is packetized to enable error checking, interleaving of data and other transmission-related functions. Additional data may accordingly be appended to the application and programming data. For example, error check sums may be appended for error detection/correction and time stamps may be included for the purpose of

20 synchronizing associated audio and video signals. The packetized information from compression/packetization units 14-16 is fed into multiplexing unit 17, which intersperses the packets prior to transmission. The interspersed packets are then broadcast to the receiving stations 20. (Although only one receiving station is shown in the figure, it is contemplated that the audio-video-interactive signal is broadcast to a group of subscribing receiving stations.) In the figure, the audio-video-interactive signal is depicted as being transmitted

25 via satellite broadcast through antenna 19.

The broadcast signal is relayed by communications satellite 28 and received by receiving station 20. Although the figure illustrates a satellite transmission, it is contemplated that any broadcast medium (e.g., CATV or direct satellite transmission) may be used. Receiving station 20 is contemplated to be one of a number of such stations which are subscribers of the broadcast service provider operating broadcast station 10.

30 The broadcast signal is collected by receiving antenna 21 and fed to set-top box 22. Set-top box 22 processes the packetized signal to reconstruct the television programs and interactive applications embodied in the signal. The reconstructed applications are executed in the set-top box, while the reconstructed television programs are passed to television 23, where they are displayed. (It is noted that television 23 can be any suitable monitor or display device.) The interactive applications may generate graphics or audio which are combined with the

35 television program prior to being displayed. The interactive applications may also be displayed in place of the television programming.

In addition to the broadcast channel between the broadcast station and receiving station, there may be other channels, such as a modem channel (which may also be referred to as an http channel, or hypertext transfer protocol channel.) These types of channels serve two functions in the system: they allow the set-top

box to provide data to the broadcast station; and they provide an alternate path for from sources 11-13 to be delivered to receiving station 20. It should also be noted that, if receiving station 20 and server 13 are connected via a transmission medium other than the broadcast station's broadcast channel and return path, the server is not constrained to be located at the broadcast station. It may be more convenient to locate server 13 at a site which is separate from broadcast station 10 in order to reduce the workload of the broadcast station, to more efficiently convey data between the receiving station and the server, or for other reasons.

Referring to Fig. 2, a block diagram of a set-top box 22 in one embodiment is shown. The broadcast signal is received and fed into tuner 31. Tuner 31 selects the channel on which the broadcast-audio-video-interactive signal is transmitted and passes the signal to processing unit 32. (Tuner 31 may be replaced by other means, all collectively referred to herein as input ports, for receiving signals from various signal sources.) Processing unit 32 demultiplexes the packets from the broadcast signal if necessary and reconstructs the television programs and/or interactive applications embodied in the signal. The programs and applications are then decompressed by decompression unit 33. The audio and video information associated with the television programs embodied in the signal is then conveyed to display unit 34, which may perform further processing and conversion of the information into a suitable television format, such as NTSC or HDTV audio/video. Applications reconstructed from the broadcast signal are routed to random access memory (RAM) 37 and are executed by microprocessor 35. Graphics tablet 39 provides a means for the user to supply handwritten information for conversion to text and subsequent use by the applications. (In other embodiments, graphics tablet 39 may be replaced by a microphone for supplying voice data or some other type of input device for supplying non-textual information to the system.)

Microprocessor 35 may comprise various types of microprocessors, micro-controllers, digital signal processors (DSPs), or other types of software instruction processing devices, as are appropriate to the particular design. RAM 37 may include memory units which are static (e.g., SRAM), dynamic (e.g., DRAM), volatile or non-volatile (e.g., Flash memory), as required to support the functions of the set-top box. When power is applied to the set-top box, microprocessor 35 executes operating system code which is stored in ROM 36. (In some embodiments, ROM 36 may comprise Flash memory or EEPROMs.) The operating system code executes continuously while the set-top box is powered in the same manner the operating system code of a typical personal computer (PC) and enables the set-top box to act on control information and execute interactive and other applications. The set-top box also includes modem 38. Modem 38 provides both a return path by which viewer data can be transmitted to the broadcast station and an alternate path by which the broadcast station can transmit data to the set-top box.

Although the term "set-top box" is used herein, it is understood that this term refers to any receiver or processing unit for receiving and processing a transmitted signal and conveying the processed signal to a television or other monitor. The set-top box may be in a housing which physically sits on top of a television, it may be in some other location external to the television (e.g., on the side or back of the television or remotely located from the television), or it may be incorporated into the television itself. Alternatively, the functionality of the set-top box may be entirely removed from the television and placed in a more remote location, such as outside a house in which the set-top box is located. Set-top box 22 serves to demodulate (if necessary) the signal received from broadcast station 10 and to separate the components of the signal, such as different

television programs and interactive applications. Other embodiments of the set-top box may have different components or interconnections than those shown in Fig. 2. Similarly, television 23 may be a television or a video monitor employing any suitable television format (e.g., NTSC or HDTV), or it may be replaced by other devices, such as a video recorder, depending on the particular embodiment.

5 Referring to Fig. 3, a block diagram illustrating the components of a graphics tablet 50 is shown. The main components of graphics tablet 50 are display 51, digitizer 52 and processor 53. Graphics tablet 50 can have a wide range of sizes, from several inches across (as used in pen computing systems) to several feet across (as used in some CAD systems). It is contemplated that the most convenient size for the graphics tablet will be the size of a small or medium sized notepad. The surface of graphics tablet 50 should be flat and smooth to
10 facilitate use as a writing surface. Although graphics tablet 50 is contemplated to be connected to set-top box 22 by a data cable, infrared transmission or any other suitable transmission means may also be used to transmit data between graphics tablet 50 and set-top box 22. To the extent that graphics tablet 50 is not constrained by these data transmission means, the user should be able to move the tablet to a convenient and comfortable writing position.

15 Display 51 and digitizer 52 are overlaid so that the path of a digitizer pen (not shown) can be displayed as the user writes on the tablet, thereby simulating writing on a notepad. Display 51 is contemplated to be a flat panel display using LCD (liquid crystal diode) or similar technologies. These technologies use substances this those between two plates of glass to control the amount of light which passes through the display. Depending upon the chosen technology, the display may simply control the amount of light from any source behind the
20 display, or it may generate varying amounts of light from each pixel in the display. The display can be configured to provide feedback to the user by displaying his or her handwriting, or it may display icons or other images representative of the user's input. The display may also be configured to display forms, or other prompts, in response to which the user can provide handwritten information. In an alternate embodiment, graphics tablet 50 may be simplified by eliminating display 51. In such an embodiment, the user could instead
25 receive visual feedback, including prompts, forms, handwriting and other images through television 23.

The combination of display 51 and digitizer 52 should be selected to provide sufficient resolution to allow an accurate digital representation of the user's handwriting. It is contemplated that the resolution of the digitizer and display should be roughly equivalent to that of a fairly high-quality printer. The combination should also provide display quality (e.g., brightness and contrast) which makes the handwritten information
30 easy for the user to see. Microprocessor 53 should be fast enough that the path of the digitizer pen is displayed without any substantial delay as it is drawn by the user. Although microprocessor 53 is shown separately from microprocessor 35, it is contemplated that a single device may be sufficient to perform both functions.

Digitizer 52 may also be constructed using one of a number of technologies. Although early technologies often used opaque structures, technologies used in modern digitizers are more likely to incorporate
35 transparent panels which are designed to be used in conjunction with overlaid displays. Digitizer 52 may use electrostatic, resistive film or capacitive/electrostatic film technologies. Various embodiments of the invention may incorporate different ones of the technologies which are best suited to the particular embodiments. Digitizer 52 senses the position of the digitizer pen and transmits the corresponding X-Y coordinates to the set-top box. In one embodiment, this X-Y data is recorded as a series of darkened pixels in a bitmap image of the

text written by the user. The image is then transmitted to the server for processing and recognition of the written data. The recognition of the bitmap image is sometimes referred to as off-line recognition.

In an alternate embodiment, digitizer 52 may sense not only X-Y position, but also the direction of the pen's path, the pen's angle, speed and acceleration, and other information which forms a vectorized representation of the user's handwriting. This vectorized information can be transmitted to the server as it is produced so that recognition can be performed as the user is writing. The use of vectorized information to recognize handwritten information is sometimes referred to as on-line recognition.

The receiving station is operatively connected to the broadcast station by a broadcast channel. This broadcast channel can utilize various transmission media and is contemplated to include media such as coaxial cable and free space (e.g., as used for direct satellite transmissions.) The broadcast channel forms a transmission path between the broadcast station and the receiving station. The broadcast station and receiving station are also connected by a return path. The return path typically consists of a pair of modems, one in the receiving station and one in the broadcast station, each connected to a standard telephone line. Other means for establishing a return path (e.g., using a portion of the bandwidth of the broadcast channel) are also contemplated. The system illustrated in Fig. 1 utilizes the broadcast channel to establish a return path for communicating data from the receiving station to the server.

In one embodiment, an application is transmitted from the broadcast station to the receiving station, where it is reconstructed and executed. In alternate embodiments, the application may be resident in the set-top box or may be provided to the set-top box by means other than the broadcast channel (e.g., flash card.) Fig. 4 is a flow diagram illustrating the flow of handwritten/textual information in the system. While the application is executing 61, it prompts the user for some sort of textual information 62. The user enters the information on the graphics tablet 63, writing the information in his or her normal handwriting. The graphics tablet digitizes the image of the user's writing and conveys the digitized data to the set-top box, which transmits the information to the server 64 via the return path to the broadcast station. The image data is received by the broadcast station and passed on to the server. The server processes the image data 65, recognizing characters and/or words in the image and producing the equivalent textual data. This textual data is then transmitted back to the receiving station 66, either via the broadcast channel or via the return channel. The textual data is then utilized by the application executing in the set-top box 67 as if the text had been directly entered by the user.

Fig. 5 is a flow diagram illustrating the manner in which the server's handwriting recognition application processes the image data to produce textual data. An off-line, bitmap recognition system is used in this embodiment. It is assumed in this instance that the user's handwriting is not contained in a form, but is instead free-form input to the graphics tablet. Further, in one embodiment, the handwriting image is transmitted to the server in segments as they are generated by the graphics tablet. This may serve both to reduce the peak loading of the server resulting from recognition of the image and to allow the server to provide simultaneous feedback (i.e., recognized characters) to the user. ("Simultaneous" as used here means that some recognized text is transmitted to the set-top box as the user continues to write on the graphics tablet so that the user can see the results of the handwriting recognition.) If the image instead combines text with a known form, the form is first identified and removed. Then, if the handwriting was confined to several boxes or fields on the form, these fields are isolated and handled individually. (Free-form handwritten entries may be distinguished from each

other in the same manner as form entries by providing different dialog boxes in which the user can write the entries.)

The handwriting in a field is recognized by first breaking the image into segments showing characters or pieces of characters 71. The individual image segments and combinations of these image segments are selected as character candidates 72. These character candidates are assigned character classes and associated values representative of the confidence with which the recognition application places the segment in the associated character class 73. The character candidates are organized into groups for which a dictionary look-up algorithm can be performed 74. A dictionary look-up determines the word entries which best match the groups of character candidates 75 and may assign a level of confidence to each word. If desired, an acceptability check can be performed to determine whether the confidence level of the recognized words is sufficiently high 76. If the confidence level is too low, the word can be rejected and the image will be considered unrecognizable. The user can also be given the option of checking the textual output of the recognition application and accepting or rejecting all or part of the output 77. After the user has verified the accuracy of the recognized text, the data can be provided to the application executing in the set-top box. It should be noted that the description is intended to be illustrative rather than restrictive and that the process of recognizing vectorized handwriting data or voice data will differ from the foregoing description.

The recognition of the user's handwriting may be assisted by the association of contextual information with the handwriting. If the user's handwriting comprises entries on a form, identifying the type of information requested for each entry may make it easier to interpret the entry itself. For example, an entry in a box requesting a social security number should contain nine digits. A character in this entry which might be interpreted as a "1", an "l" or and "I" must be the numeral "1". The identification of keywords such as "to" or "cc:" may likewise distinguish the handwriting which follows as a name or address.

The system described above can be used with a number of different applications. For example, an interactive television service provider may wish to provide e-mail service to subscribers. The user can select the e-mail application furnished by the service provider and proceed to write the message which he or she wishes to send on the graphics tablet. In the message, the user writes the address of the intended recipient and the message to be sent to the recipient. The graphical data is transmitted to the server, which may segment the image data and then convert the data to text, or it may convert the entire image to text and then parse the text to determine the recipient's address. In an alternate embodiment, only the address of the message is converted to text while the body of the message is transmitted to the recipient as an image. Although the address of the e-mail must be computer-readable so it can be properly routed to the recipient, the body of the message need not be converted to text -- the recipient can read the message embodied in the image whether or not it is converted to text data. In fact, it may in some cases be preferable to deliver some messages as image data so that the sender can communicate drawings or other non-textual data. Delivery of the image of a handwritten note may also be preferable because simple text messages may be considered impersonal.

The user may be given the option of selecting an addressee from an address book or a list of previous addressees. A menu can be presented to the user via the graphics tablet to allow selection of one of these addressees. New addressees which are handwritten can be added to the user's address book. The user can also select other options (e.g., sending an image versus sending text only) in the same manner as selecting an

addressee. The information which the user enters via the graphics tablet may therefore be a mix of handwriting and selection of particular predefined inputs. A system which uses a microphone for non-textual input may also be configured to allow selection of predefined inputs by using audio prompts and corresponding menus.

5 In another embodiment, the system may be configured to send faxes instead of e-mail. The foregoing description of the e-mail-configured system is in large part applicable to the fax-configured system. The user can enter a destination fax number and/or addressee via the graphics tablet, and this information can then be transmitted to the server for conversion into textual information. The textual information is then transmitted
10 back to the set-top box and used by the fax application to dial the destination fax. As for the e-mail-configured system, the transmitted fax may be an image of the user's handwriting, or it may be an image of textual information corresponding to the user's handwriting. (It should be noted that in this instance, the system may convert the user's handwriting to textual information so that the information is more legible than handwriting or so that more information will fit on a page, but the transmitted fax will by its nature consist of image data rather than textual data.)

15 Another example of an application with which the system can be employed is electronic commerce service. Electronic commerce services are those through which the user can buy items or otherwise conduct business. These services include online catalogs and home shopping services. When using an online catalog, the user can browse through the catalog to determine which products he or she would like to order. The user can provide item information via menu entries, but must enter non-standardized information such as a shipping address via the graphics tablet.

20 In another embodiment, the user can enter his information by voice. The user can use a microphone or a telephone handset to provide voice data to the system. The microphone may a special-purpose microphone for use with the interactive television system or it may be a telephone handset. A special-purpose microphone may be connected to the set-top box, or it may be built into a remote control for the system. A telephone handset may be connected to the set-top box, or it may be connected directly to the return path (i.e., telephone
25 line.) The voice data is transmitted to the server, which uses voice recognition software to convert the voice data into textual data. The textual data is returned to the set-top box, where it can be displayed to the user. The user can correct the text or confirm that the text has been accurately generated from the voice data.

30 While the present invention has been described with reference to particular embodiments, it will be understood that the embodiments described above are illustrative and that the scope of the invention is not limited to these embodiments. Many variations, modifications, additions and improvements to the described embodiments are possible. These variations, modifications, additions and improvements are intended to be within the scope of the invention as detailed within the following claims.

WHAT IS CLAIMED IS:

1. An interactive television system comprising:
a receiving station having an input device configured to receive non-textual information from a user;
5 and
a server coupled to said receiving station by a transmission medium,
wherein said server is configured to receive said non-textual information from said receiving
station and to convert said non-textual information into textual information,
wherein said server is further configured to provide said textual information to one or more
10 interactive applications executing within said interactive television system.
2. The interactive television system of claim 1 wherein said receiving station includes a microprocessor
configured to execute one of said one or more interactive applications, wherein said server is configured to
transmit said textual information to said receiving station, and wherein said receiving station is configured to
15 receive said textual information from said server and provide said textual information to said application.
3. The interactive television system of claim 2 further comprising a broadcast station coupled to said
receiving station by a broadcast channel.
- 20 4. The interactive television system of claim 3 wherein said server is coupled to said broadcast station and
wherein said transmission medium comprises a return path between said broadcast station and said receiving
station.
5. The interactive television system of claim 4 wherein said receiving station includes a first modem,
25 wherein said broadcast station includes a second modem and wherein said return path comprises a telephone
line coupled to said first and second modems.
6. The interactive television system of claim 4 wherein said return path comprises a portion of the
bandwidth of said broadcast channel between said broadcast station and said receiving station.
- 30 7. The interactive television system of claim 2 wherein said input device comprises a graphics tablet.
8. The interactive television system of claim 7 wherein said graphics tablet comprises a digitizer
configured to generate data corresponding to handwriting inscribed thereon.
- 35 9. The interactive television system of claim 8 wherein said graphics tablet further comprises a display
overlaid with said digitizer and configured to display an image of said handwriting as said handwriting is
inscribed on said digitizer.

10. The interactive television system of claim 2 wherein said receiving station further comprises a display and wherein said receiving station is configured to present said textual information on said display for verification of said textual information by said user.

5 11. The interactive television system of claim 2 wherein said input device comprises a microphone.

12. A set-top box for use in an interactive television system having a server configured to convert said non-textual information to corresponding textual information, the set-top box comprising:

10 a microprocessor configured to execute an interactive application which requires textual information from a user;
an input device for receiving non-textual information from said user;
transmitting means coupled to said input device for transmitting said non-textual information to a server; and
receiving means coupled to said microprocessor for receiving said corresponding textual information
15 from said server, wherein said receiving means is configured to convey said corresponding textual information to said microprocessor for use by said interactive application.

13. The set-top box of claim 12 wherein said input device comprises a graphics tablet configured to receive handwriting inscribed thereon by said user and wherein said non-textual information comprises digitized
20 information corresponding to said handwriting.

14. The set-top box of claim 12 wherein said input device comprises a microphone configured to receive voice information.

25 15. The set-top box of claim 12 wherein said transmitting means comprises a modem.

16. The set-top box of claim 12 wherein said receiving means comprises a broadcast receiver.

17. The set-top box of claim 12 wherein said microprocessor is configured to prompt said user for said
30 non-textual information, to receive said non-textual information and to provide said non-textual information to said transmitting means.

18. A method implemented in an interactive television system for providing textual input to an interactive application executing in the system, the method comprising:
35 providing non-textual information to said interactive television system;
conveying said non-textual information to a server;
converting said non-textual information to textual information in said server;
providing said textual information to said application.

19. The method of claim 18 wherein said application is executing on a set-top box and wherein the method further comprises conveying said textual information to said set-top box.

20. The method of claim 19 wherein providing said non-textual information comprises writing characters
5 on a graphics tablet coupled to said interactive television system and wherein said graphics tablet is configured to digitize said characters and produce said non-textual information therefrom.

21. The method of claim 20 wherein converting said non-textual information to said textual information
10 comprises executing a handwriting recognition application on said server and providing said non-textual information to said application to produce said textual information.

22. The method of claim 19 wherein providing said non-textual information comprises speaking into a microphone coupled to said interactive television system and wherein said microphone is configured to produce said non-textual information from spoken words.

[REDACTED]

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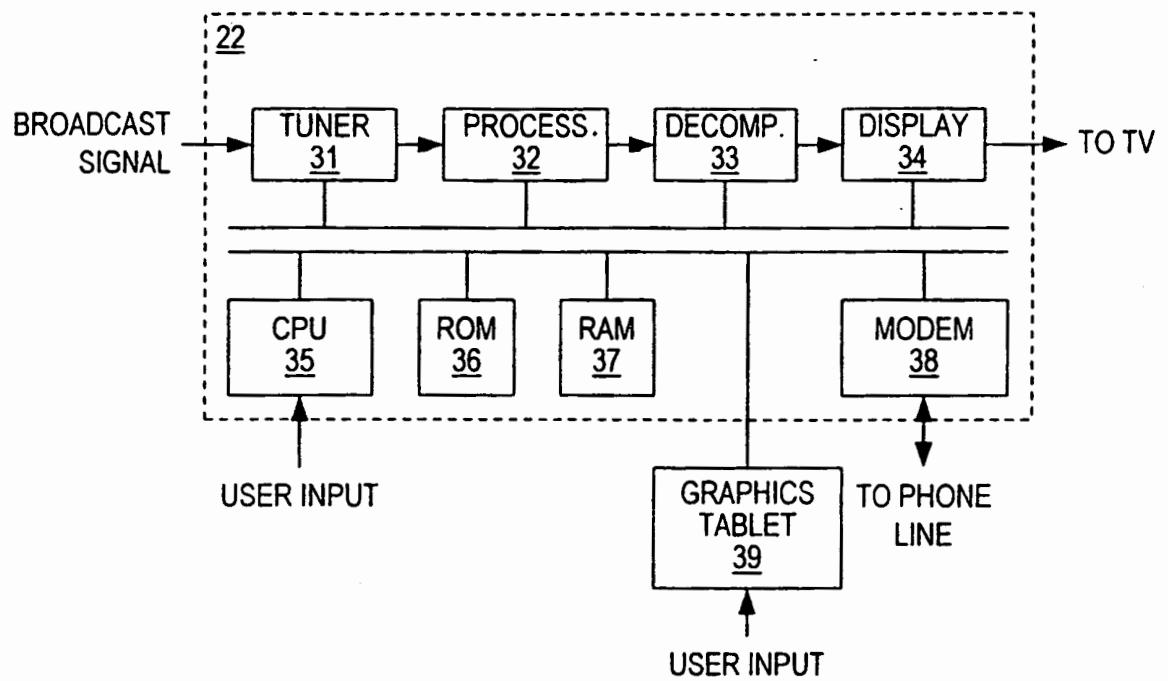


FIG. 2

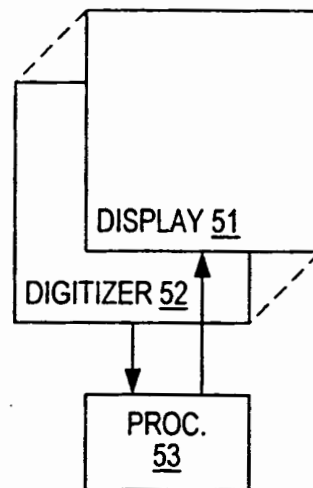


FIG. 3

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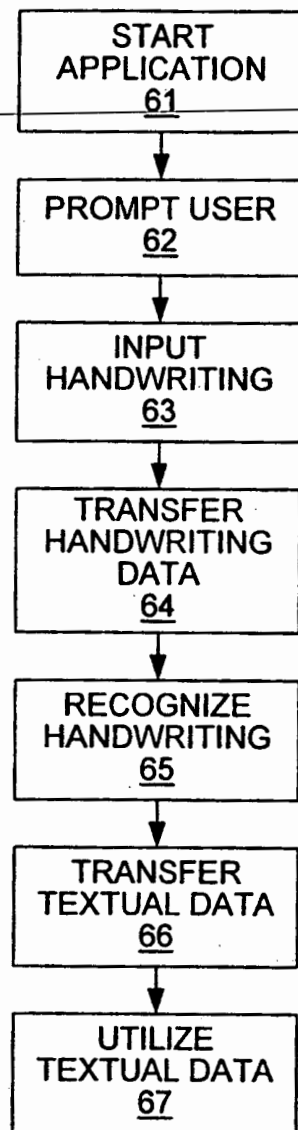


FIG. 4

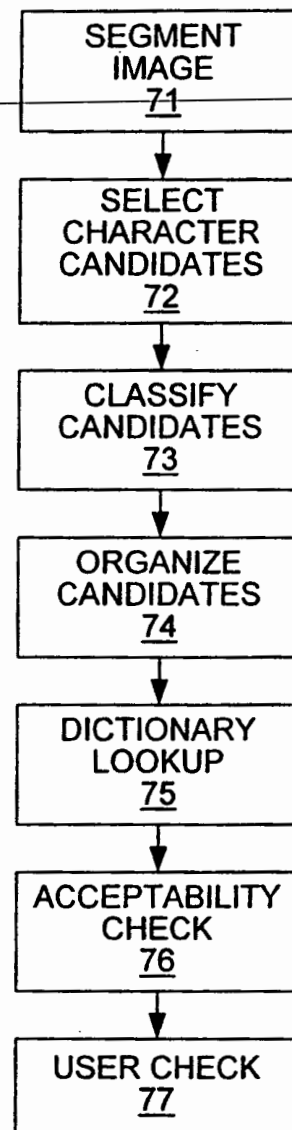


FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/24710

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H04N7/173 H04N5/445

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 689 155 A (CANON KK) 27 December 1995 (1995-12-27) column 8, line 17 - line 42 column 12, line 4 - line 42 ---	1-9, 11-22
Y	EP 0 838 945 A (MATSUSHITA ELECTRIC IND CO LTD) 29 April 1998 (1998-04-29) page 4, line 13 - line 15 page 4, line 43 - line 51 page 5, line 24 - line 30 --- -/--	7-9, 11, 13, 14, 19-22

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

8 February 2000

Date of mailing of the international search report

15/02/2000

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

Inter. nal Application No

PCT/US 99/24710

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	"SPEECH RECOGNITION METHODS FOR CONTROLLING CABLE TELEVISION" IBM TECHNICAL DISCLOSURE BULLETIN, US, IBM CORP. NEW YORK, vol. 38, no. 8, 1 August 1995 (1995-08-01), pages 285-287, XP000534519 ISSN: 0018-8689 page 286, paragraph 1 -----	1-6, 12, 15-19, 22
A	EP 0 633 661 A (TEXAS INSTRUMENTS ITALIA SPA ; TEXAS INSTRUMENTS INC (US)) 11 January 1995 (1995-01-11) column 2, line 26 - line 40 -----	7-9, 13, 20, 21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/24710

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0689155 A	27-12-1995	JP 8007032 A DE 69511786 D DE 69511786 T US 5982928 A	12-01-1996 07-10-1999 30-12-1999 09-11-1999
EP 0838945 A	29-04-1998	US 5889506 A JP 10191468 A	30-03-1999 21-07-1998
EP 0633661 A	11-01-1995	IT 1261803 B DE 69421123 D	03-06-1996 18-11-1999

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Search Results - Record(s) 1 through 3 of 3 returned.

L1: Entry 1 of 3

File: USPT

Aug 31, 2004

US-PAT-NO: 6785653

DOCUMENT-IDENTIFIER: US 6785653 B1

TITLE: Distributed voice web architecture and associated components and methods

DATE-ISSUED: August 31, 2004

US-CL-CURRENT: 704/270.1; 704/270, 704/275INT-CL: [07] G10 L 21/00, G10 L 15/00

L1: Entry 2 of 3

File: USPT

Jun 3, 2003

US-PAT-NO: 6573907

DOCUMENT-IDENTIFIER: US 6573907 B1

TITLE: Network distribution and management of interactive video and multi-media containers

DATE-ISSUED: June 3, 2003

US-CL-CURRENT: 715/719; 709/217, 715/512, 715/513, 715/716, 715/720, 715/721,
715/723, 715/726, 715/733INT-CL: [07] G06 F 3/00

L1: Entry 3 of 3

File: USPT

Jun 6, 1989

US-PAT-NO: 4837830

DOCUMENT-IDENTIFIER: US 4837830 A

TITLE: Multiple parameter speaker recognition system and methods

DATE-ISSUED: June 6, 1989

US-CL-CURRENT: 704/238; 704/246, 704/250

INT-CL: [04] G10L 5/06

[Previous Page](#)[Next Page](#)

PLUS Search Results for S/N 09785375, Searched October 25, 2004

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present. PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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WEST Search History

DATE: Tuesday, March 15, 2005

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☐	L11	L10 and link	176
☐	L10	(speaker adj identification) and channel	346
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☐	L8	5600775.pn.	1
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☐	L6	5237648.pn.	1
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END OF SEARCH HISTORY



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/785,375	02/16/2001	Theodore Calderone	AGLE0001	5055
22862	7590	03/18/2005	EXAMINER	
GLENN PATENT GROUP 3475 EDISON WAY, SUITE L MENLO PARK, CA 94025			CHAWAN, VIJAY B	
			ART UNIT	PAPER NUMBER
			2654	

DATE MAILED: 03/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/785,375	Applicant(s) CALDERONE ET AL.	
	Examiner Vijay B. Chawan	Art Unit 2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☒ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-66 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) ____ is/are rejected.
- 7) ☒ Claim(s) 1-66 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)	4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ____.
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)	5) ☐ Notice of Informal Patent Application (PTO-152)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>10/01, 7/01, 5/01/</u> .	6) ☐ Other: ____.

DETAILED ACTION

Specification

1. Applicant is reminded of the proper content of an abstract of the disclosure.

A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. In certain patents, particularly those for compounds and compositions, wherein the process for making and/or the use thereof are not obvious, the abstract should set forth a process for making and/or use thereof. If the new technical disclosure involves modifications or alternatives, the abstract should mention by way of example the preferred modification or alternative.

The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

Where applicable, the abstract should include the following:

- (1) if a machine or apparatus, its organization and operation;
- (2) if an article, its method of making;
- (3) if a chemical compound, its identity and use;
- (4) if a mixture, its ingredients;
- (5) if a process, the steps.

Extensive mechanical and design details of apparatus should not be given.

2. The disclosure is objected to because of the following informalities: The disclosure is objected to because the term "voice recognition" is misused for what nowadays is called –**speech recognition**—in the speech signal processing art. While "voice recognition" and "speech recognition" were both once used interchangeably to refer to spoken word recognition, nowadays the terms are distinguished. The term "**voice** recognition" now denotes identification of **who** is doing the speaking

(class 704/246), while “**speech** recognition” (or “**word** recognition”) denotes identification of what is being said (class 704/251). Therefore, appropriate correction to the proper terms of art is required.

Appropriate correction is required.

Claim Objections

3. Claims 1-66 are objected to because of the following informalities: The claims are objected to because of the following informalities: The disclosure is objected to because the term “voice recognition” is misused for what nowadays is called –**speech recognition**—in the speech signal processing art. While “voice recognition” and “speech recognition” were both once used interchangeably to refer to spoken word recognition, nowadays the terms are distinguished. The term “**voice** recognition” now denotes identification of **who** is doing the speaking (class 704/246), while “**speech** recognition” (or “**word** recognition”) denotes identification of what is being said (class 704/251). Therefore, appropriate correction to the proper terms of art is required. Appropriate correction is required.

Conclusion

4. This application is in condition for allowance except for the following formal matters:

See objections to the specification and the claims above.

Prosecution on the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

A shortened statutory period for reply to this action is set to expire **TWO MONTHS** from the mailing date of this letter.

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Calderone et al., (6,480,703) teach a common carrier multiple output RF upconverter.

Bly et al., (5,220,657) teach updating local copy of shared data in a collaborative system.

Madrane (6,573,907) teaches a network distribution and management of interactive video and multi-media containers.

White et al., (6,785,653) teach distributed voice web architecture and associated components and methods.

Wrench et al., (4,837,830) teach multiple parameter speaker recognition system and methods.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vijay B. Chawan whose telephone number is (703) 305-3836. The examiner can normally be reached on Monday Through Thursday 7-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (703) 305-9645. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Vijay B. Chawan
Primary Examiner
Art Unit 2654

vbc
3/16/05

VIJAY CHAWAN
PRIMARY EXAMINER

Notice of References Cited	Application/Control No. 09/785,375	Applicant(s)/Patent Under Reexamination CALDERONE ET AL.	
	Examiner Vijay B. Chawan	Art Unit 2654	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-6,480,703	11-2002	Calderone et al.	455/118
	B	US-6,573,907	06-2003	Madrane, Nabil	715/719
	C	US-5,220,657	06-1993	Bly et al.	711/152
	D	US-6,785,653	08-2004	White et al.	704/270.1
	E	US-4,837,830	06-1989	Wrench et al.	704/238
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

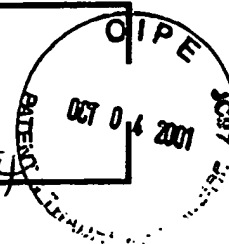
*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Form 1449 (Modified) Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)	Atty Docket No. AGLE0001	Serial No.: 09/785,375
	Applicant: Calderone et al. Filing Date: 2/16/01	Group: 2644 2.654



U.S. Patent Documents

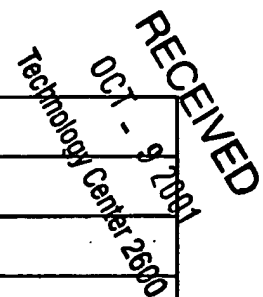
Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
VSC	A	6,192,338	2/20/2001	Haszto et al.	704	257	6/17/1999
VSC	B	6,173,279	1/9/2001	Levin et al.	707	5	4/9/1998

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication



Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Vijayshaw

3/15/05



Form 1049 (Modified) 7/8/99	Atty Docket No. AGLE0001 Applicant: Calderone, et al. Filing Date: 02/16/2001	Serial No.: 09/785,375 Group: ~~2644~~ 2654
Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)		

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
VRC	A	5,777,571	7/7/98	Chuang	341	176	10/2/96
VRC	B	6,084,572	7/4/00	Yaniger et al.	345	159	5/9/97
VRC	C	6,181,334	1/30/01	Freeman et al.	345	327	7/3/97
VRC	D	6,198,822	3/6/01	Doyle et al.	380	210	3/4/98
VRC	E	6,204,843	3/20/01	Freeman et al.	345	327	10/28/99
VRC	F	6,205,582	3/20/01	Hoarty	725	93	9/18/98
VRC	G	6,215,484	4/10/01	Freeman et al.	345	327	10/28/99
VRC	H	6,225,976	5/1/01	Yates et al.	345	156	10/30/98

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
VRC	I	ACTV Awarded Three Key Digital Television Patents; Coverage Extended to ACTV's Core Technology for Eliminating Video Switching Delay; May 8, 2001; PRNewswire
VRC	J	Sprint Begins Voice-Activated E-Mail; May 23, 1001; Associated Press-New York Times.

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Vijay Shaw

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JUL 24 2001

Technology Center 2600



Form 3449 (MAY 2001)

Information Disclosure
Statement By Applicant

(Use Several Sheets if Necessary)

Atty Docket No.
AGLE0001
Applicant:
Calderone et al.
Filing Date:
2/16/01

Serial No.:
09/785,375

Group:
2644-2654

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MAY 21 2001

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U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
VBC	A	Re. 32,012	10/22/85	Pirz et al.	381	43	3/10/80
VBC	B	4,653,045	3/24/87	Stanley et al.	370	62	2/15/85
VBC	C	4,780,906	12/25/88	Rajasekaran et al.	381	43	2/17/84
VBC	D	4,783,809	11/8/88	Gliniski	381	43	11/7/84
VBC	E	4,797,910	1/10/89	Daudelin	379	67	5/7/86
VBC	F	4,821,027	4/11/89	Mallory et al.	340	521	11/16/87
VBC	G	4,907,079	3/6/90	Turner et al.	358	84	9/28/87
VBC	H	4,931,950	6/5/90	Isle et al.	364	513	7/25/88
VBC	I	4,959,855	9/25/90	Daudelin	379	213	7/25/88
VBC	J	4,972,485	11/20/90	Dautrich et al.	381	43	5/23/89
VBC	K	5,006,987	4/9/91	Harless	364	419	3/25/86
VBC	L	5,125,024	7/23/92	Gokcen et al.	379	88	3/28/90
VBC	M	5,127,003	6/30/92	Doll, Jr. et al.	370	110.1	2/11/91
VBC	N	5,155,760	10/13/92	Johnson et al.	379	67	6/26/91
VBC	O	5,163,083	11/10/92	Dowden et al.	379	88	10/12/90
VBC	P	5,181,237	1/19/93	Dowden et al.	379	88	3/27/91
VBC	Q	5,197,005	3/23/93	Shwartz et al.	364	419	5/1/89
VBC	R	5,208,848	5/4/93	Pula	379	67	8/26/91
VBC	S	5,255,305	10/19/93	Sattar	379	34	11/1/90
VBC	T	5,274,560	12/28/93	LaRue	364	444	3/27/91
VBC	U	5,325,421	6/28/94	Hou et al.	379	67	8/24/92
VBC	V	5,329,608	7/12/94	Bocchieri et al.	395	2.52	8/18/93
VBC	W	5,353,336	10/4/94	Hou et al.	379	67	8/24/92
VBC	X	5,369,575	11/29/94	Lamberti et al.	364	419.08	5/15/92
VBC	Y	5,386,556	1/31/95	Hedin et al.	395	600	12/23/92
VBC	Z	5,434,777	7/18/95	Luciw	364	419.13	3/18/94
VBC	a	5,442,749	8/15/95	Northcutt et al.	395	200.09	7/9/93
VBC	b	5,500,920	3/19/96	Kupiec	395	2.79	9/30/94
VBC	c	5,519,608	5/21/96	Kupiec	364	419.08	6/24/93
VBC	d	5,526,034	6/11/96	Hoarty et al.	348	7	5/3/93
VBC	e	5,550,578	8/27/96	Hoarty et al.	348	7	10/6/94
VBC	f	5,553,119	9/3/96	McAllister et al.	379	67	7/7/94
VBC	g	5,564,001	10/8/96	Lewis	395	154	6/24/94
VBC	h	5,566,271	10/15/96	Tomitsuka et al.	395	2.84	4/18/94
VBC	i	5,602,963	2/11/97	Bissonnette et al.	395	2.84	10/12/93
VBC	i	5,608,624	3/4/97	Luciw	395	794	5/15/95
VBC	k	5,625,814	4/29/97	Luciw	395	605	5/15/95
VBC	l	5,634,086	5/27/97	Rtischev et al.	395	2.79	9/18/95
VBC	m	5,642,519	6/24/97	Martin	395	759	4/29/94
VBC	n	5,666,400	9/9/97	McAllister et al.	379	67	7/7/94
VBC	o	5,668,929	9/16/97	Foster, Jr.	704	273	7/22/96
VBC	p	5,671,225	9/23/97	Hooper et al.	370	468	9/1/95
VBC	q	5,719,921	2/17/98	Vysotsky et al.	379	88	2/29/96

Vijay K. Lawrence

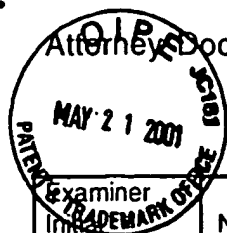
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VR	r	5,721,827	2/24/98	Logan et al.	395	200.47	10/2/96
VR	s	5,721,902	2/24/98	Schultz	395	604	9/15/95
VR	i	5,721,938	2/24/98	Stuckey	395	754	6/7/95
VR	u	5,732,216	3/24/98	Logan et al.	395	200.33	10/2/96
VR	v	5,737,495	4/7/98	Adams et al.	395	615	9/29/95
VR	w	5,748,841	5/5/98	Morin et al.	395	2.66	4/10/97
VR	x	5,748,974	5/5/98	Johnson	395	759	12/13/94
VR	y	5,748,974	5/5/98	Johnson	395	759	12/13/94
VR	z	5,774,841	6/30/98	Salazar et al.	704	225	9/20/95
VR	Aa	5,794,050	8/11/98	Dahlgren et al.	395	708	10/2/97
VR	Bb	5,794,205	8/11/98	Walters et al.	704	275	10/19/95
VR	Cc	5,802,526	9/1/98	Fawcett et al.	707	104	4/18/96
VR	Dd	5,802,526	9/1/98	Fawcett et al.	707	104	4/18/96
VR	Ee	5,805,775	9/8/98	Eberman et al.	395	12	2/2/96
VR	Ff	5,812,977	9/22/98	Douglas	704	275	8/13/96
VR	Gg	5,819,220	10/6/98	Sarukkai et al.	704	243	9/30/96
VR	Hh	5,821,508	10/13/9	Willard	235	51	12/24/96
VR	Ii	5,822,727	10/13/98	Garberg et al.	701	243	12/21/95
VR	Jj	5,826,267	10/20/98	McMillan	707	9	3/20/96
VR	Kk	5,832,063	11/3/98	Vysotsky et al.	379	88	8/1/97
VR	Ll	5,874,939	2/23/99	Galvin	345	156	12/10/96
VR	Mm	5,885,083	3/23/99	Ferrell	434	156	6/19/97
VR	Nn	5,892,813	4/6/99	Morin et al.	379	88.01	9/30/96
VR	Oo	5,893,063	4/6/99	Loats et al.	704	275	3/10/97
VR	Pp	5,915,001	6/22/99	Uppaluru	379	88.22	11/14/96
VR	Qq	5,917,891	6/29/99	Will	379	88.03	10/7/96
VR	Rr	5,923,738	7/13/99	Cardillo, IV et al.	379	93.25	7/29/97
VR	Ss	5,929,850	7/27/99	Broadwin et al.	345	327	7/1/96
VR	Tt	5,930,341	7/27/99	Cardillo, IV et al.	379	93.25	7/29/97
VR	Uu	5,933,835	8/3/99	Adams et al.	707	104	4/9/97
VR	Vv	5,937,041	8/10/99	Cardillo IV, et al.	379	93.25	3/10/97
VR	Ww	5,953,700	9/14/99	Kanevsky et al.	704	246	6/11/97
VR	Xx	5,963,940	10/5/99	Liddy et al.	707	5	8/14/96
VR	Yy	5,970,457	10/19/99	Brant et al.	704	275	8/30/96
VR	Zz	5,991,365	11/23/99	Pizano et al.	379	88.13	3/12/97
VR	AA	5,991,719	11/23/99	Yazaki et al.	704	251	9/11/98
VR	BB	5,999,970	12/7/99	Krisbergh et al.	709	217	4/10/96
VR	CC	6,003,072	12/14/99	Gerritsen et al.	709	218	6/30/94
VR	DD	6,009,398	12/28/99	Mueller et al.	704	275	4/18/97
VR	EE	6,009,470	12/28/99	Watkins	709	231	9/10/97
VR	FF	6,012,030	1/4/00	French-St. George et al.	704	275	4/21/98
VR	GG	6,018,711	1/25/00	French-St. George et al.	704	275	4/21/98
VR	HH	6,021,371	2/1/00	Fultz	701	200	4/16/97
VR	II	6,026,388	2/15/00	Liddy et al.	707	1	8/14/96
VR	JJ	6,026,388	2/15/00	Liddy et al.	707	1	8/14/96
VR	KK	6,034,678	3/7/00	Hoarty et al.	345	327	12/9/97
VR	LL	6,100,883	8/8/00	Hoarty	345	327	6/4/96

Vijay Khawar

3/15/05



Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No
VBZ	MM	99/30501	6/17/99	PCT	7	173		X
VBZ	NN	98/26595	6/18/98	PCT	7	173		X

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
VBZ	OO	John Dowding, Jean Mark Gawron, Doug Appelt, John Bear, Lynn Cherny, Robert Moore, and Douglas Moran; <u>Gemini: a Natural Language System for Spoken-Language Understanding</u> ;
VBZ	PP	<u>Info Wiz: An Animated Voice Interactive Information System</u> ; http://www.ai.sri.com/~oaa/infowiz.html
VBZ	QQ	Robert Moore, Douglas Appelt, John Dowding, J. Mark Gawron, and Douglas Moran; <u>Combining Linguistic and Statistical Knowledge Sources in Natural-Language Processing for ATIS</u> ;
VBZ	RR	Amanda Stent, John Dowding, Jean Mark Gawron, Elizabeth Owen Bratt, and Robert Moore; <u>The CommandTalk Spoken Dialogue System</u> ;
VBZ	SS	John Dowding, Elizabeth Owen Bratt and Sharon Goldwater; <u>Interpreting Language in Context in CommandTalk</u> ; February 5, 1999
VBZ	TT	Robert Moore, John Dowding, Harry Bratt, J. Mark Gawron, Yonael Gorfu, and Adam Cheyer; <u>CommandTalk: A Spoken-Language Interface for Battlefield Simulations</u> ; October 23, 1997
VBZ	UU	John Dowding, Robert Moore, Francois Andry, and Douglas Moran; <u>Interleaving Syntax and Semantics in an Efficient Bottom-Up Parser</u> ;
VBZ	VV	Robert C. Bedichek; <u>The Meerkat Multicomputer: Tradeoffs in Multicomputer Architecture</u> ; Dissertation Given and University of Washington, 1994
VBZ	WW	James Karney; <u>A Sound Proposition Even Early on, There are Already Ways to Voice-enable a Site</u> ; January 15, 2001; Internet World
VBZ	XX	Sarah Roberts-Witt; <u>Talking to the Web</u> ; January 15, 2001; Internet World;
VBZ	YY	Hand out from SRI International; <u>Simple UI to Retrieve Favorites</u>
VBZ	ZZ	Email dated January 15, 2001; Subject <u>Fwd: Large Linux Cluster</u>
VBZ	aa	Email: <u>Cray inc. Announces Plans for Alpha Linux Supercluster System</u> ; February 12, 2001
VBZ	bb	Email: <u>Fwd: Re: One Voice Technologies</u> ; February 15, 2001
VBZ	cc	Email: <u>Fwd: Re: One Voice Technologies</u> ; February 15, 2001
VBZ	dd	Email: <u>Fwd: Re: One Voice Technologies</u> ; February 15, 2001
VBZ	ee	Email: <u>Fwd: Ars Technica: Inside the KLAT2 Supercomputer - Page 1-</u>
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VBZ	gg	Printout: http://WWW.SPEECH.SRI.COM/DEMOS/ATIS.HTML

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Vijay Chawan

3/15/05

Form 1449 (Modified) Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)	Atty Docket No. AGLE0001	Serial No.: Unassigned 09/785,375
	Applicant: Calderone et al.	
	Filing Date: Herewith	Group: Not Assigned 2654

J1017 U.S. PTO
 09/785375
 02/16/01

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
VBC	A	4,506,387	5/19/85	Walter	455	612	5/25/83
VBC	B	4,633,499	12/30/86	Nishioka et al.	381	43	10/8/82
VBC	C	4,757,541	7/12/88	Beadles	381	43	12/1/86
VBC	D	4,827,520	5/2/89	Zeinstra	381	43	1/16/87
VBC	E	4,847,885	7/11/89	Vittorelli	379	6	7/8/88
VBC	F	4,991,217	2/5/91	Garrett et al.	381	43	11/30/84
VBC	G	5,165,095	11/17/92	Borcherding	379	88	9/28/90
VBC	H	5,199,062	5/30/93	Von Meister et al.	379	67	11/8/91
VBC	I	5,231,670	7/27/93	Goldhar et al.	381	43	3/19/92
VBC	J	5,247,347	9/21/93	Litteral et al.	358	85	9/27/91
VBC	K	5,271,088	12/14/93	Bahler	395	2	4/7/93
VBC	L	5,333,237	7/26/96	Stefanopoulos et al.	395	12	6/8/92
VBC	M	5,335,276	8/2/94	Thompson et al.	380	21	12/16/92
VBC	N	5,345,538	9/6/94	Narayannan et al.	395	2.84	1/27/92
VBC	O	5,349,678	9/20/94	Morris et al.	395	800	8/21/91
VBC	P	5,475,792	12/12/95	Stanford et al.	395	2.42	11/25/94
VBC	Q	5,513,298	4/30/96	Stanford et al.	395	2.52	5/18/95
VBC	R	5,585,858	12/17/96	Harper et al.	348	485	8/12/94
VBC	S	5,608,448	3/4/97	Smoral et al.	348	7	4/10/95
VBC	T	5,615,296	5/25/97	Stanford et al.	395	2.1	11/12/93
VBC	U	5,664,061	9/2/97	Andreshal et al.	704	275	6/5/95
VBC	V	5,671,328	9/23/97	Fitzpartick et al.	395	2.55	12/30/92
VBC	W	5,726,984	3/10/98	Kubler et al.	370	349	10/5/95
VBC	X	5,729,659	3/17/98	Potter	395	2.79	6/6/95
VBC	Y	5,752,232	5/12/98	Basore et al.	704	275	11/14/94
VBC	Z	5,752,246	5/12/98	Rogers et al.	707	10	6/7/95
VBC	a	5,774,525	6/30/98	Kanevsky et al.	379	88	8/14/97
VBC	b	5,774,859	6/30/98	Houser et al.	704	275	1/3/95
VBC	c	5,774,860	6/30/98	Bayya et al.	704	275	10/30/96
VBC	d	5,809,471	9/15/98	Brodsky	704	275	3/7/96
VBC	e	5,819,225	10/6/98	Eastwood et al.	704	275	5/30/96
VBC	f	5,832,439	11/3/98	Cox, Jr. et al.	704	275	12/14/95
VBC	g	5,855,002	12/29/98	Armstrong	704	270	6/11/96
VBC	h	5,860,059	1/12/99	Aust et al.	704	231	3/5/97
VBC	i	5,864,815	1/26/99	Rozak et al.	704	275	7/31/95
VBC	j	5,864,819	1/26/99	De Armas et al.	704	275	11/8/96
VBC	k	5,867,817	2/2/99	Catallo et al.	704	255	8/19/96
VBC	l	5,884,265	3/16/99	Squitteri et al.	704	275	3/27/97
VBC	m	5,890,122	3/30/99	Van Kleeck et al.	704	275	2/8/93
VBC	n	5,890,123	3/30/99	Brown et al.	704	275	6/5/95
VBC	o	5,903,870	5/11/99	Kaufman	704	275	9/18/95
VBC	p	5,920,841	7/6/99	Schottmuller et al.	704	275	6/25/97
VBC	q	5,946,050	8/31/99	Wolff	348	553	10/4/96

Vijay B. Chawar

3/15/05

VBZ	r	5,960,399	9/28/99	Barclay et al.	704	270	12/24/97
VBZ	s	5,974,385	10/26/99	Ponting et al.	704	275	12/13/95
VBZ	t	6,012,030	1/4/00	French-St. George et al.	704	275	4/21/98
VBZ	u	6,035,267	3/7/00	Watanabe et al.	704	1	9/26/96
VBZ	v	6,035,275	3/7/00	Brode et al.	704	275	1/9/98

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No

Other Documents

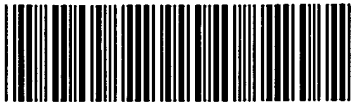
Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
VBZ	w	Bruce Meyerson, <u>Vice Recognition Still Selective</u> , January 15, 2000, Yahoo! News Alerts
VBZ	x	<u>Where can I get an inVoca?</u> , http://invoca.com/home/htm
VBZ	y	<u>Integrated Audio-Graphics User Interface.</u> , April 1991, IBM Technical Disclosure Bulletin
VBZ	z	Stephanie Miles, <u>Will Microsoft's next OS run your TV?</u> , September 5, 2000, Yahoo! Daily News

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Vijay Bhawan

3/15/05

Index of Claims



Application No.

09/785,375

Examiner

Vijay B. Chawan

Applicant(s)

CALDERONE ET AL.

Art Unit

2654

√	Rejected
=	Allowed

—	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim		Date									
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Search Notes

Application No.

09/785,375

Examiner

Vijay B. Chawan

Applicant(s)

CALDERONE ET AL.

Art Unit

2654

SEARCHED

Class	Subclass	Date	Examiner
704	270-278 231, 251, 246	3/10/2005	VBC
715	719,512	3/10/2005	VBC
715	513,716	3/10/2005	VBC
715	721,723	3/10/2005	VBC
715	726,733	3/10/2005	VBC
709	217	3/10/2005	VBC

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

**SEARCH NOTES
(INCLUDING SEARCH STRATEGY)**

	DATE	EXMR
see attached WEST search		



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 United States Patent and Trademark Office
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BIBDATASHEET

CONFIRMATION NO. 5055

Bib Data Sheet

SERIAL NUMBER 09/785,375	FILING DATE 02/16/2001 RULE	CLASS 704	GROUP ART UNIT 2654	ATTORNEY DOCKET NO. AGLE0001

APPLICANTS

Theodore Calderone, San Carlos, CA;
 Paul M. Cook, Woodside, CA;
 Mark J. Foster, Palo Alto, CA;

**** CONTINUING DATA *******

This appln claims benefit of 60/210,440 06/08/2000
 and is a CIP of 09/679,115 10/04/2000
 and is a CIP of 09/664,874 09/19/2000 ABN
 and is a CIP of 09/661,486 09/14/2000
 and is a CIP of 09/708,315 11/07/2000 PAT 6,480,703

**** FOREIGN APPLICATIONS *******

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
**** 04/04/2001**

**** SMALL ENTITY ****

Foreign Priority claimed 35 USC 119 (a-d) conditions met Verified and Acknowledged	☐ yes ☒ no ☐ yes ☐ no ☐ Met after Allowance Examiner's Signature <i>VBC</i> Initials	STATE OR COUNTRY CA	SHEETS DRAWING 35	TOTAL CLAIMS 66	INDEPENDENT CLAIMS 4

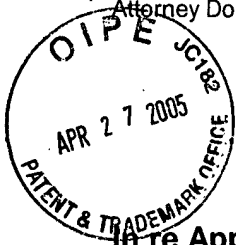
ADDRESS

22862
 GLENN PATENT GROUP
 3475 EDISON WAY, SUITE L
 MENLO PARK, CA
 94025

TITLE

System and method of voice recognition near a wireline node of a network supporting cable television and/or video delivery

FILING FEE RECEIVED 874	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Calderone et al

Docket No.: AGLE0001

5 **Serial No.:** 09/785,375

Art Unit: 2654

Filed: 02/16/2001

Examiner: Chawan, Vijay B.

New Title: System and Method of Voice Recognition Near a Wireline Node of a Network Supporting Cable Television and/or Video Delivery

10

Dated: 26 April 2005

Mail Stop – Amendment
Commissioner for Patents
15 P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE

Applicant responds to the Office Action mailed 18 March 2005 as follows:

Applicant submits herewith a replacement abstract in keeping with the comments provided by the examiner in the detailed action portion of the above identified Office Action.

Applicant also provides a replacement specification in which the term "voice recognition" has been replaced with the term --speech recognition--. In this regard Applicant uses the term "speech recognition" to denote identification of what is being said. Applicant points out that there are two instances in the specification where the Applicant refers to "voice print" technology. In this instance Applicant is referring to identification of who is doing the speaking. However, these two instances are not concerned with the subject matter set forth in the independent claims.

The claim objections appear to be based on the inconsistency of use of the terms voice recognition and speech recognition in the specification and accordingly, with the submission of the replacement specification, these objections are deemed overcome.

The Commissioner is authorized to charge any fees and credit any overpayments due to the Glenn Patent Group Deposit Account No. 07-1445, Customer No. 22862. Applicant considers this document to be filed in a timely manner.

Respectfully Submitted,


Michael A. Glenn
Reg. No. 30,176

Customer No. 22862



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Calderone et al

Docket No.: AGLE0001

Serial No.: 09/785,375

Art Unit: 2654

Filed: 02/16/2001

Examiner: Chawan, Vijay B.

New Title: System and Method of Voice Recognition Near a Wireline Node of a Network Supporting Cable Television and/or Video Delivery

Dated: 26 April 2005

INFORMATION DISCLOSURE STATEMENT

Sir:

This Information Disclosure Statement is submitted:

☐ under 37 CFR 1.97(b), or

(within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)

☒ under 37 CFR 1.97(c) together with either a:

☒ Certification under 37 CFR 1.97(e), or

☐ a \$220.00 fee under 37 CFR 1.17(p), or

(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)

☐ under 37 CFR 1.97(d) together with a:

☐ Certification under 37 CFR 1.97(e), and

☐ a \$220.00 fee under 37 CFR 1.17(d)(2)(ii), and

☐ a \$130.00 petition fee set forth in 37 CFR 1.17(i)(1)

(Filed after final action or notice of allowance, whichever occurs first, but before payment of the issue fee)

☒ The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 07-1445 (Order No. AGLE0001). A copy of this sheet is enclosed for accounting purposes.

(X) Applicant(s) submit herewith Form PTO 1449 -- Information Disclosure Citation together with copies of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.25.

() A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 37 CFR 156(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on form PTO 1449 and is enclosed herewith.

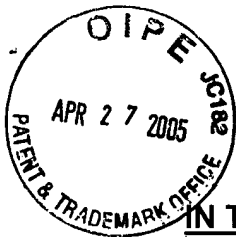
It is requested that the information disclosed herein be made of record in this application.

Respectfully Submitted,



Michael Glenn
Attorney For Applicant
Reg. No. 30,176

Customer No. 22862



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Calderone et al

Docket No.: AGLE0001

Serial No.: 09/785,375

Art Unit: 2654

Filed: 02/16/2001

Examiner: Chawan, Vijay B.

New Title: System and Method of Voice Recognition Near a Wireline Node of a Network Supporting Cable Television and/or Video Delivery

Dated: 26 April 2005

**CERTIFICATION FOR
INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §1.97(e)**

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

A certification is being made for the Information Disclosure Statement accompanying this certification.

CERTIFICATION

I, the person signing below, certify

(X) that each item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the statement. (37 CFR 1.97(e)(1))

() that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in §1.56(c) more than three months prior to the filing of the statement. 37 CFR 1.97(e)(2).

The person making this certification is the attorney who signs below on the basis of the information:

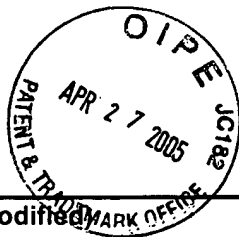
- () supplied by the inventor(s)
- () supplied by an individual designated in §1.56(c)
- (x) in the attorney's file

Respectfully submitted,



Michael A. Glenn
Reg. No. 30,176

Customer Number 22862



Form 1449 (Modified) Information Disclosure Statement By Applicant	Atty Docket No. AGLE0001	Serial No.: 09/785,375
	Applicant: Calderone et al.	
	Filing Date: 02/16/2001	Group: 2654

U.S. Patent Application Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	A	5,446,489	08/29/1995	Egendorf	348	003	01/25/1994
	B	5,774,859	06/30/1998	Houser	704	275	01/03/1995

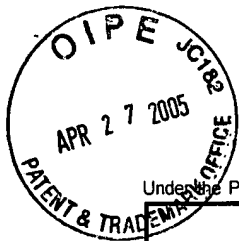
Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



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Attached to this cover-sheet please find the following documents:

- Response (2 pages);
- Replacement Specification and Abstract (90 pages)
- Information Disclosure Statement (2 pages in duplicate);
- Certification for IDS (2 pages);
- 1449 Form (1 page); and
- Return postcard

Burden Hour Statement: This form is estimated to take 0.03 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.



**SYSTEM AND METHOD OF ~~VOICE~~ SPEECH RECOGNITION
NEAR A WIRELINE NODE OF A NETWORK SUPPORTING
CABLE TELEVISION AND/OR VIDEO DELIVERY**

This application claims priority from Provisional Patent Application no.
5 60/210,440, entitled Method and Apparatus for Centralized Voice-Driven
Natural Language Processing, docket number AGLE0001PR, filed 8 June,
2000.

This application is a continuation in part from Application no. 09/679,115,
entitled System and Method of a Multi-dimensional Plex Communication
10 Network, docket number AGLE0003, filed 14 October, 2000;

Application no. 09/664,874, entitled Increased Bandwidth In Aloha-Based
Frequency-Hopping Transmission Systems, docket number AGLE0005, filed
19 September, 2000;

Application no. 09/661,486, entitled N-way Demultiplexor, docket number
15 AGLE0008, filed 14 September, 2000; and

Application no. 09/708,315, entitled Common Carrier, Multiple Output RF
Upconverter docket number AGLE0015, filed 7 November, 2000.

Background of the Invention

Technical field

20 This invention relates to ~~voice~~-speech recognition performed near a wireline
node of a network supporting cable television and/or video delivery.

Background Art

Currently, ~~voice~~-speech operated functions using the latest ~~voice~~-speech
recognition technologies are limited to a handful of applications, such as toys,
25 appliances, some computers, ~~voice~~-speech dictation, cellular phones, and
~~voice~~-speech control of one's home. Most of these applications use ~~voice~~
speech recognition technology running on a computer or ~~voice~~-speech

recognition chip technology. These ~~voice~~-speech recognition systems typically offer only a limited number of commands and the recognition efficiency is only fair and often require ~~voice~~-speech training.

There have been numerous patents issued regarding ~~voice~~-speech recognition. Many apply in a telephone context or other dial-up context such as an Automated Teller machine (ATM), including the following: Rabin, *Voice command control and verification system*, U.S. Patent No. 6,081,782, issued June 27, 2000, Basore, et al, *Voice activated device and method for providing access to remotely retrieved data*, U.S. Patent 5,752,232, issued May 12, 1998, and Kowalkowski, et al, *Voice-control integrated field support data communications system for maintenance, repair and emergency services*, U.S. Patent No. 5,924,069, issued July 13, 1999.

There is, however, another class of ~~voice~~-speech recognition technology referred to as natural language, which requires state of the art processing software and hundreds of megabytes of RAM to support. Natural language ~~voice~~- recognition is currently being used in high end systems, such as billing applications for utility companies and the New York Stock Exchange, because of its ability to recognize spoken words from any speech ~~voice~~. Some natural language systems claim to be totally user independent and are also capable of recognizing speech in several different languages.

However, the problems of ~~voice~~-speech recognition at a centralized wireline node in a network supporting video delivery or cable television delivery have not been addressed by such prior art. For the purposes of the discussion herein, a centralized wireline node refers to a network node providing video or cable television delivery to multiple users using a wireline physical transport between those users at the node.

Figure 1 depicts a typical network as found in a cable television and/or video delivery network employing a Hybrid Fiber-Coaxial (HFC) wiring scheme as disclosed in the prior art.

Each user site contains a Set Top Box, such as STB 180, coupling to the network through a coaxial cable 172, which interfaces 170 to a collective

coaxial cable **160** which couples to a Node **126**. The interface **170** may include bi-directional signal amplification and possibly further include the filtering and/or frequency shifting of these signals.

The Node **126** is hierarchically coupled **128** to a Headend **104**, which in most cable television networks serves as the source of television programming and other signaling. The signals are sent through the Node **126** and couplings **160-170-172** to provide the STB **180** and others, with the television signaling. In certain large towns and cities, there may be a further hierarchical layer including a Metropolitan Headend **10** coupled **106** to Headend **104**. These higher layers of the network use fiber optics for the physical transport of couplings **102**, **106** and **108**, as well as for **122**, **126** and **128**.

The couplings between STB **180** and Node **126** support bi-directional communication. The couplings between STB **180**, Node **126** and Headend **104** may also support bi-directional communication. Such bi-directional communication allows the STB **180** to receive multiple television channels. This bi-directional communication allows STB **180** to signal at least limited information to the Node **126** and/or the Headend **104**. Such information in either case may support management of Pay-per-View and other services.

User site accounting information usually resides at the highest level of the network, which tends to be either the Headend **104** or Metropolitan Headend **10**.

In cable systems, several downstream data channels that send channel and synchronization information are often transmitted in a previously reserved band of frequencies. They are typically assigned for re-broadcasting FM channels over cable in the United States. Currently, most cable systems reserve some of the 88 to 108 MHz FM spectrum for set-top data transmission. The unused portion of that spectrum are left for barker channels or for additional video channels. The Open Cable Standard requires that the 70 to 130 MHz band be available for what's called Out-of-Band or (OOB) or Downstream transmission.

Most current cable systems use the popular HFC architecture so that the downstream video signals, digital or analog, are sent from the Headend to hubs or nodes via fiberoptic cable. At the receiving side of the node, the optical signal from the fiber gets converted to an electrical signal containing all of the analog, digital video RF carriers and program/service information. This signal, in turn, is amplified and distributed via coaxial cable to the appropriate subscribers connected to the node.

A major design objective for existing cable television set-top boxes was efficient downstream information delivery, *i.e.* from cable plant to subscriber. Provision for upstream data transmission, *i.e.* from subscriber to cable plant, is much more restrictive, supporting only limited bandwidth. As new classes of interactive services become available, efficient use of upstream transmission bandwidth grows in importance. For example, if it is necessary to pass voice information from the subscriber to the cable headend (also known as the headend), sufficient upstream bandwidth must be made available.

One of the most popular digital set-top boxes, the General Instruments (now Motorola) DCT-2000, is a useful example. When this box was first deployed, upstream transmissions were restricted to user pay-per-view requests, and other simple, infrequent transmissions. As a consequence, the transmission format used for upstream transmissions was not required to be very efficient, and in fact, is not.

In this set-top box, the transmission hardware is capable of selecting twenty different 256K bps channels, each of which uses QPSK transmission coding. While the hardware is capable of frequency-hopping to avoid channels which are subject to interference, the scheme used is fairly static, with typical deployments only using two active upstream communications channels. This leads to an aggregate bandwidth of only 512K bps per cluster of set-top boxes converging in the network to a node, in cable television terms. The cable node typically supports between 500 and 2000 subscribers.

Upstream signals in the 5 to 40 MHz band from each subscriber connected to the node are collected, combined, and then sent to the Headend via either the same fiber used for the downstream video carriers, or a separate fiber.

Furthermore, the transmission control protocol used, referred to as Aloha, is one where an individual set-top box immediately transmits any pending request to the headend, without regard to whether or not the transmission channel is already in use. This transmission is repeated at regular intervals until the box receives an acknowledgement command from the headend, indicating successful receipt of the transmission.

This transmission control protocol is quite inefficient due to the number of collisions which ensue, e.g. simultaneous transmissions from different set-top boxes which interfere with one another, forcing all of the transmitters to repeat their transmissions again. This leads to typical channel utilization on the order of just 30%. As a consequence, the total bandwidth available for upstream transmission per node is only about 30% of 512K bps = ~137K bps, on average.

Downstream control data transmission typically occurs in a separate frequency band from the upstream channels.

Typically, HFC networks employ an optical fiber from a central office, or Headend, to a neighborhood node. The fiber has forward and reverse transmission capability, which can alternatively be accommodated on separate fibers. Wavelength Division Multiplexing (WDM) can be used to implement both on a single fiber. At the node, coaxial cable connects the users through a shared frequency division multiplexing (FDM) scheme with contention resolution protocols used to manage upstream data flows.

Such communication schemes having both forward and backward paths, and which may or may not involve a user, are referred to as loops herein. An example of a loop is the communication between Headend **104** and Node **126**. Communication schemes having both forward and backward paths to multiple users are referred to as local loops. An example of a local loop is the

communication between Node **126** and user site STBs **180**, **182** and **184**. Note that a loop may be constituted out of optical fiber or out of coaxial cable.

Hybrid-Fiber-Copper (HFCop) networks work in much the same manner, but substitute copper wire(s), often in twisted pairs, for coaxial cable. In such
5 networks a local loop may further be constituted out of optical fiber, coaxial cable or twisted pairs.

Another alternative local loop configuration is commonly known as Switched Digital Video. It is a form of HFC coupling the fiber through a node to each user site with a distinct point-to-point coaxial cable. The node interfaces the
10 user site coaxial cables with the optical fiber through a switch. The switch typically contains a network management unit which manages the switch, connecting the bandwidth service provider with multiple homes, today often in the range of five to 40 homes per switch.

The Synchronous Optical NETwork (SONET) scheme is also applied in the
15 creation of high-speed networks for homes and businesses. This and similar communication schemes may be employed to deliver video streams to user sites.

Figure **2** depicts a typical residential broadband network using local loop wiring of the network, as disclosed in the prior art.

20 As in Figure **1**, each user site contains a Set Top Box, such as STB **180**, coupled to the network through a coaxial cable **172** which interfaces **170** to a collective coaxial cable **160** which is coupled to Node **126**. Interface **170** may include bi-directional signal amplification, and possibly further include the filtering and/or frequency shifting of these signals.

25 As in Figure **1**, the couplings between STB **180** and Node **126** support bi-directional communication allowing the STB **180** to receive multiple television channels and allowing STB **180** to signal at least limited information to the Node **126**, which may well include management of Pay-per-View and other services. The couplings between STB **180**, Node **126** and Headend **104** may
30 also support bi-directional communication allowing the STB **180** to receive

multiple television channels and allowing STB 180 to signal at least limited information to the Headend 104, which may well include management of Pay-per-View and other services.

Figure 2 shows a loop coupling Headend 104 through coupling 130 to Node 120 through coupling 132 to Node 124 through coupling 134 to Node 126 which in turn couples 136 to Headend 104 forming the loop.

The hierarchical coupling of Node 126 with Headend 104 is carried out along distinct paths through this loop. Communication from Headend 104 to Node 126 follows a path 130-132-134. Communication from Node 126 to Headend 104 follows the path 136. The specific wiring schemes are dominated by the choice of physical transport, communication protocols and network level management. The description just given for Figure 2 is provided as a simplified discussion of the basics of how high speed residential broadband networks incorporate loops and local loops supporting network level hierarchies.

There has been extensive research into the mechanics of speech recognition. The progress has been sufficient to allow ~~voice~~-speech trading by stock brokers using their desk top computers.

While these innovations have been substantial, they do not resolve several central questions of great importance to cable television, video delivery systems, and commerce. There is no present system providing ~~voice~~-speech recognition to a collection of users over a cable television network. There is no present system providing user identification based upon that ~~voice~~-speech recognition over a network that supports cable television and/or video delivery. There is no present system sufficient for real-time auctions and contracting to be conducted over a cable television and/or video delivery network, based on user identification through ~~voice~~-speech recognition.

Summary of the invention

An embodiment of the invention provides speech recognition services to a collection of users over a network that supports cable television and/or video

delivery. User identification based upon speech recognition is provided over a cable television and/or video delivery network. User identified speech contracting is provided over a cable television and/or video delivery network having sufficient bandwidth for real-time auctions and contracting.

- 5 The invention comprises a multi-user control system for audio visual devices that incorporates a speech recognition system that is centrally located in or near a wireline node, and which may include a Cable Television (CATV) Headend. The speech recognition system may also be centrally located in or near a server farm a web-site hosting facility, or a network gateway.
- 10 In these embodiments of the invention, spoken commands from a cable subscriber are recognized and then acted upon to control the delivery of entertainment and information services, such as Video On Demand, Pay Per View, Channel control, on-line shopping, and the Internet. This system is unique in that the speech command which originates at the user site, often the
- 15 home of the subscriber, is sent upstream via the return path (often five to 40 MHz) in the cable system to a central speech recognition and identification engine. The speech recognition and identification engine described herein is capable of processing thousands of speech commands simultaneously and offering a low latency entertainment, information, and shopping experience to
- 20 the user or subscriber.

The system is capable of overlaying text on the subscriber's TV screen immediately after a word is recognized by the system as a verification of correct or incorrect recognition, thereby providing instant visual feedback and opportunity for acceptance or correction of speech messages.

- 25 The system can recognize and process speech so that the key words of spoken commands are recognized and displayed. This may be applied in navigation mode, in search context, or in other contexts and modes.

- The system responds to a command with a visual indication of the spoken request. This visual feedback indicates recognition of key words may and be
- 30 in the form of written text or icons.

The system may mask delays in upstream transmission or speech recognition. Upon depressing an optional talk button on the remote, a digital address may be appended to the beginning of the digital speech packets to be processed. The address tells the system not only the user site, but it also
5 provides a mechanism for the system to begin generating masking screens or icons. Data are sent to the central location when the button on the microphone is depressed, alerting the system as to the user site and a potential input. This function allows the system to generate an icon or overlay to respond to the subscriber quickly. This function also supports site specific
10 dictionaries, as well as voice— data references to be loaded for speech recognition or user recognition.

At least two operations are performed at a server-center located at a central location: upstream recognition of speech commands and performing speech command protocol(s).

15 Low latency visual prompts are provided to support fast and accurate speech navigation. Thus, when a command is spoken and recognized the system returns the key word and optionally generates a list of visual prompts that guides the subscriber through the next navigation step. By using prompts, the system incorporates optimum recognition of the prompt words thus increasing
20 the recognition accuracy and, at the same time, increasing satisfaction for user participation.

In this context of the invention, adaptive speech recognition is based on optimized word recognition by creating a subset of probable matches based on knowing what is in an entertainment database or the words on a Web
25 page. This supports learning the user's habitual speech patterns.

Secure speech transactions provide a method of speech based contracting across a multimedia distribution system. Speech based contracting as used herein, refers to a process of generating and/or executing a contract, in which at least one step of that process is based upon the invention receiving,
30 recognizing, and witnessing an identified user's speech.

Speech based contracting includes, but is not limited to, the following: a first identified user making an offer; a second identified user accepting an offer, which may or may not be acoustically presented; as well as the second identified user specifying acceptance particulars, such as payment
5 arrangements and the number of units.

Speech based contracting also includes, but is not limited to, acknowledging receipt of goods or services of a tangible, and/or intangible nature, possibly involving real property, personal property and/or intellectual property, exercising options of the contract, as well as terminating a pre-existing
10 contract. The acknowledgement of receipt may include, but is not limited to, a declaration of the condition of goods upon receipt or upon subsequent testing, which may include an estimate of damage.

Speech based contracting may also include at least one of the following: the second identified user making a counter-offer to the first identified user based
15 upon the offer; and the first identified user responding to the counter offer. The response may include accepting the counter-offer, or making a second counter-offer to the second identified user.

Speech based contracting may also include the second identified user inviting offers. The invitation may or may not specify the first identified user and/or
20 performance constraints such as time of delivery and/or the duration of the terms and/or optional terms which may be exercised after the contract has been accepted.

Speech based contracting may also include an identified user exercising one or more optional terms of a pre-existing contract. The exercise of the optional
25 terms may further specify one or more amounts, delivery times, ranges of time and/or place during/over which a service may be performed or commodity delivered in accordance with the optional terms of the pre-existing contract.

The offer may originate at the offeror-user site, possibly involving speech, when it is sent to the central location and recognized at the central location,
30 recorded, distributed, and presented to potential offeree user sites. The offer may be sent to the central location to be recorded and distributed to potential

offeree user sites. The offeree may signal acceptance of the offer verbally at the offeree user site where the offeree is recognized. The system transmits the verbal acceptance to the central location, where it is recognized, recorded and then transmitted to the offeror.

- 5 Using the user site address accelerates speaker identification, increases reliability, enhances security and reduces latency in identifying a speaker. Using the user site address and user specific ~~voice~~-speech data references further accelerates speaker identification, increases reliability, enhances security, and reduces latency in identifying a speaker.
- 10 The invention supports automatic generation of serial-multiplexed video output streams, without additional video boards or multiplexers. The centrally located speech recognition system employs extremely fast, efficient arrays of microprocessors, many of which may possess a frame buffer in locally accessible memory. Each microprocessor translates the frame buffer into an
- 15 MPEG stream. Several MPEG streams are merged within a single microprocessor to form a multi-media stream for distribution to subscribers.

Brief Description of the Drawings

Figure 1 depicts a typical network hierarchy as found in a cable television or video delivery network employing a Hybrid Fiber-Coaxial (HFC) wiring

20 scheme as disclosed in the prior art;

Figure 2 depicts a typical residential broadband network using local loop wiring of the network as disclosed in the prior art;

Figure 3 depicts a remote control unit **1000** coupled **1002** to set-top apparatus **1100**, communicating via a two-stage wireline communications system

25 containing a wireline physical transport **1200** through a distributor node **1300**, and through a high speed physical transport **1400**, possessing various delivery points **1510** and entry points **1512-1518** to a tightly coupled server farm **3000**, with one or more gateways **3100**, and one or more tightly coupled server arrays **3200**, in accordance the invention;

Figure 4 depicts a coupled server array **3200** of Figure 3;

Figure 5 depicts a gateway **3100** of Figure 3;

Figure 6 depicts the tightly coupled server farm **3000** of Figure 3 implemented in a two-dimensional plex communication network with N=4 plex nodes in each of two orthogonal directions of the node array;

Figure 7 depicts a gateway **3100** of Figure 3 implemented in a two-dimensional plex communication network with N=4 plex nodes in each of two orthogonal directions of the node array;

Figure 8 depicts a coupled server array **3200** of Figure 3 implemented in a two-dimensional plex communication network with N=4 plex nodes in each of two orthogonal directions of the node array;

Figure 9 depicts a simplified block diagram using an array of processors as shown as **3200** in Figure 3;

Figure 10 depicts a flowchart of a method using a back channel from a multiplicity of user sites containing a multiplicity of identified speech channels presented to a speech processing system at a wireline node in a network supporting cable television delivery in accordance with the invention;

Figure 11A depicts a detail flowchart of operation **2012** of Figure 10 further partitioning of the received back channel;

Figure 11B depicts a detail flowchart of operation **2022** of Figure 10 further processing the multiplicity of the received identified speech channels;

Figure 11C depicts a detail flowchart of operation **2032** of Figure 10 further responding to the identified speech content;

Figure 12 depicts a detail flowchart of operation **2000** of Figure 10 further performing the method using the back channel from multiple user sites;

Figure 13A depicts a detail flowchart of operation **2112** of Figure 11C further responding to the identified speech content;

Figure **13B** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the speech content;

Figure **14** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

- 5 Figure **15A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

Figure **15B** depicts a detail flowchart of operation **2252** of Figure **15A** identifying the user;

- Figure **16** depicts a detail flowchart of operation **2112** of Figure **11C** further
10 responding to the identified speech content from the associated user site;

Figure **17A** depicts the speech content response **2350** including current response menu **2352** and cumulative user site response **2354** in accordance with the invention;

- Figure **17B** depicts a detail flowchart of operation **2112** of Figure **11C** further
15 responding to the identified speech content from the associated user site;

Figure **18A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site;

Figure **18B** depicts a detail flowchart of operation **2092** of Figure **11B** further processing the multiplicity of the received speech channels;

- 20 Figure **19A** depicts a simplified block diagram of a hand held remote **1000**, containing microphone **1060** and keypad **1020** supporting user input which is organized and processed by embedded controller **1050** for communication by wireless interface **1040** coupled **1002** to set-top apparatus **1100**, as shown in Figure **3**;

- 25 Figure **19B** depicts a simplified block diagram of set-top apparatus **1100** as shown in Figure **3** showing coupling **1002** and first wireline physical transport **1200** further comprised of downlink coupling **1202** and uplink coupling **1204**;

Figure **19C** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000** and coupled **1112** with set-top box **1110** possessing downlink coupling **1202** and uplink coupling **1204**;

5 Figure **19D** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000** and possessing downlink coupling **1202** and uplink coupling **1204** as well as providing processed downlink coupling **1114** to set-top box **1110** and receiving initial uplink coupling **1112** from set-top box **1110**;

10 Figure **20A** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19C** supporting coupling **1002** with hand held remote **1000** and coupling **1112** with set-top box **1110**;

Figure **20B** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19D** supporting coupling **1002** with hand held remote **1000**
15 and couplings **1112** and **1114** with set-top box **1110**;

Figure **20C** depicts a block diagram further depicting accessibly coupled **1162** memory **1160** as shown in Figures **20A** and **20B**;

Figure **21** depicts a remote control unit **1000-180** coupled **1002-180** to set-top apparatus **1100-180**, communicating via a two-stage wireline communications
20 system containing a wireline physical transport **1200** through an augmented distributor node **1310** interfacing to a wireline communications loop including an augmented Headend **1410** further supporting a communications loop including augmented metropolitan Headend **1410**, in accordance with the invention;

25 Figure **22** depicts a remote control unit **1000-180** coupled **1002-180** to set-top apparatus **1100-180**, communicating via a two-stage wireline communications system containing a wireline physical transport **1200** through a distributor node **126** interfacing to a wireline communications loop including an augmented Headend **1414** further supporting a communications loop

including augmented metropolitan Headend **1410**, in accordance with the invention;

Figure **23** depicts a detail block diagram of an augmented distributor node **1310**, coupled to wireline physical transport **1200** and coupled to the wireline communications loop of Figure **21**;

Figure **24** depicts an alternative detail block diagram of an augmented distributor node **1310**, coupled to wireline physical transport **1200** and coupled to the wireline communications loop of Figure **21**;

Figure **25** depicts a generic block diagram of a prior art Headend **104** as shown in Figure **3**;

Figure **26** depicts an augmented Headend **1410** of Figure **21** or an augmented Headend **1414** of Figure **22** or an augmented metropolitan Headend **1410** of Figures **21** or **22**, in accordance with the invention;

Figure **27** depicts an alternative augmented Headend **1410** of Figure **21** or an alternative augmented Headend **1414** of Figure **22** or an alternative augmented metropolitan Headend **1410** of Figures **21** or **22**, in accordance with the invention;

Figure **28A** depicts a block diagram of a speech engine **1330** as shown in Figure **23**;

Figure **28B** depicts a block diagram of a speech engine **1330** as shown in Figure **24**;

Figure **29** depicts a more detailed block diagram of a speech engine **1330** as shown in Figure **28A**;

Figure **30** depicts an alternative detailed block diagram of a speech engine **1330** as shown in Figure **28A**;

Figure **31** depicts a second alternative detailed block diagram of a speech engine **1330** as shown in Figure **28A**;

Figure **32A** depicts a block diagram of modulator engine **1350** of Figures **23** and **24**, and modulator engine **1450** of Figures **26** and **27**;

Figure **32B** depicts a block diagram of a local oscillator as is known in the art for use as a local oscillator depicted in Figures **33** and **34** as LO1 **1760**, LO1
5 **1860**, LO2 **1770** or LO2 **1870**;

Figure **33** depicts a detail block diagram of frequency conversion circuitry **1710** of Figure **32A**;

Figure **34** depicts an alternative detail block diagram of frequency conversion circuitry **1710** of Figure **32A**; and

10 Figure **35** depicts a detailed diagram of speech engine **1330** as shown in Figure **23** or speech engine **1430** as shown in Figure **27** containing two plex communications grids with dual, redundant gateways.

Detailed Description of the Invention

Figure **3** depicts a remote control unit **1000** coupled **1002** to set-top apparatus
15 **1100**. Set-top apparatus **1100** communicates via a two-stage wireline communications system containing a wireline physical transport **1200** to a distributor node **1300**. Set-top apparatus **1100** communicates through distributor node **1300** across a high-speed physical transport **1400** to a tightly coupled server farm **3000**, possessing various delivery points **1510** and entry
20 points **1512-1518**. Tightly coupled server farm **3000** contains one or more gateways **3100**, and one or more tightly coupled server arrays **3200**.

As used herein, a server farm refers to a collection of at least two server components communicatively coupled to one another. The server components may or may not all be directly communicatively coupled to each
25 other. A server component refers to at least a gateway, server array, server computer, database engine, or disk farm.

As used herein, gateway refers to at least one of the following: A gateway may perform protocol conversion between different types of networks or applications; gateways may support complete conversion of one protocol to

another, or support one protocol from within another protocol; a gateway may perform conversion between two messaging or mail protocols; a gateway may act as a go-between for two networks with similar protocols, providing an entry/exit point for one network in the other network. Such gateways include proxy servers; a gateway may switch speech and data between a terrestrial network and an orbiting satellite communications system; and a gateway may perform network layer switching tasks between at least two networks, coordinating the delivery of information, usually in the form of messages, packets or data streams to various destinations in the networks.

10 As used herein, a server array refers to a multi-dimensional lattice or array of server computers, each with an associated multi-dimensional array address, and a communication grid supporting communication between server computers based upon the multi-dimensional array addresses of the source and destination server computers. A tightly coupled server array is a server array possessing a very low latency communication grid.

The invention may include a remote control unit **1000** fitted with a microphone. Remote control unit **1000** may be fitted with such features as a special noise canceling microphone and/or a push-to-talk button.

20 The microphone in the remote relays the subscriber's speech commands to the central speech recognition engine. The push-to-talk button may begin the process of speech recognition by informing the system that the subscriber is about to speak and also to provide immediate address information. Address information identifies the user site at which the speaking occurs.

25 The invention may also include an array of microphones that are operated in conjunction with a remote control **1000** that is coupled to the set top box **1100**. The microphone array may further provide an echo-canceling capability in receiving ~~voice~~ speech signals within the area of usage.

Note that there may be more than one remote control unit **1000** with one or more microphones, each remote control unit under the control of a distinct, identified user. Such situations are particularly useful in game playing

settings, where different users may wish to make commands to the game simulation like "arm the photon torpedoes", etc.

A given residence may include more than one set-top box **1100**, each of which has a distinct address in the network delivering video content and/or cable television. Each constitutes a distinct user site and may be
5 parameterized differently. By way of example, a first set-top box in a recreation area for children may allow identified users, who are children, to select programming on only certain channels. Whereas a second set-top box in a private area of adults, such as a parental bedroom, may be
10 parameterized so that child identifier users have no privileges.

Speech commands from the subscriber may be preprocessed. The analog signals picked up from the microphone are converted to digital signals where they undergo additional processing before being transmitted to the speech recognition and identification engine located in the cable Headend or other
15 centralized location. Such speech preprocessing may include encryption, compression, or conversion to an alternative form of speech representation.

The preprocessing function may also take place in the remote control **1000** itself before being transmitted to the set-top box **1100**, or set-top appliance **1100**. Coupling **1002** may use a wireline or wireless physical transport.
20 Coupling **1002** may use a wireless transport, including, but not limited to, at least one of the infra-red, microwave, or radio frequency spectrum, as well as ultrasonic signaling. Coupling **1002** may support bi-directional communication between remote control **1000** and set-top box or appliance **1100**. The communication may be predominantly or strictly from remote control **1000** to
25 set-top box or appliance **1100**.

The speech signal from the remote **1000** may be a digitally modulated RF signal whose properties may comply with Part 15 of the FCC rules. Alternatively, the set-top box **1100**, or set-top appliance **1100**, receives the speech signal from the remote **1000** and performs the preprocessing function
30 mentioned above.

The set-top box **1100**, or set-top appliance **1100** may also be used to transmit speech and subscriber address data to the centralized location or Headend for speech recognition and identification. The Radio Frequency (RF) signal from the remote **1000** is received by the set-top appliance **1100** and then re-
5 modulated for upstream transmission **1200** on the 5 to 40 MHz cable return path. If a commercial set-top box **1100** is used to transmit the upstream speech data, then the upstream channel allocation and transmission protocol are controlled by the bi-directional communication system which is resident in the set-top box.

10 In certain embodiments, a commercial set-top box **1100** may not be used to transmit the digitized speech data upstream. The set-top appliance **1100** is then responsible for receiving the upstream channel allocation and synchronization information. The data receiver in the set-top appliance **1100** can be tuned to any one of several downstream data channels to receive
15 channel and synchronization information.

The set-top appliance **1100** is also capable of receiving and decoding data in the downstream path. This function is required to organize and synchronize the transmission of upstream data which may include user feedback. Downstream data can contain upstream channel allocation information and
20 speech verification overlay information coded as text.

The set-top box **1100** may be used for both upstream and downstream communication for the described speech command function. The function of the set-top appliance **1100** may be to receive the RF signal from the remote control and then digitize and compress the speech signal and prepare it for
25 upstream transmission.

New RF protocol standards, such as Blue Tooth, allow the remote control's RF signal to transmit the speech signal directly to the set-top box where again, the preprocessing can either be done in the remote control **1000** or executed from firmware within the set-top box **1100**. Note that infra-red
30 signaling may be employed to transmit the speech signal to the set-top box.

Set-top boxes **1100** that employ the DOCSIS type cable modems such as Open Cable set-top boxes or the so called Heavy Set-top boxes from such companies as Scientific Atlanta and General Instruments are capable of sending and receiving speech data using efficient data transmission protocols.

- 5 The DOCSIS protocol also incorporates error detection and correction capabilities as well as other transmission enhancements such as pre-equalization for more efficient and error free transmission.

Figure 4 depicts a coupled server array **3200** of Figure 3.

Figure 5 depicts a gateway **3100** of Figure 3.

- 10 The system uses the subscriber's address information as a mechanism by which the centrally located AgileTV™ Speech Processor can fetch a particular subscriber's parameter file. The parameter file contains speech training parameter data, speech identification parameters and user profiles for each user at that address. This file can also contain parental control information in
15 a residential setting and other specifics for that particular address, such as language preferences or movie preferences or even internet preferences.

- The Addressed Subscriber Parameter File (ASPF) gives the system an extremely high probability of speech recognition and user identification. Such addressing supports secure transactions such as banking because the
20 speech recognition and identification system has to only identify a few parameter files for any one physical address, resulting in a very high probability of recognizing a specific speaker's speech.

- Financial transaction security, e.g. speech banking and e-commerce, can be realized with this system and, with the addition of speech encryption
25 processing in the Speech Preprocessor, even higher levels of security can be attained. This directly supports a method of contracting based upon an offer presented to the user by the system, and a recognizable acceptance of the offer by the identified user. The method of contracting may further include storing the offer and acceptance as a recording mechanism for the contract.

The speech signal transmitted from a subscriber's set-top box, or set-top appliance, **1100** is received **1510** by the five to 40 MHz data receiving equipment within gateway **3100** in the central location. As used herein, a central location may include a node, Headend, or metropolitan Headend for a residential broadband network.

When the digitized speech signal comes from a commercial set-top box, such as a General Instruments or a Scientific Atlanta set-top, then the return path receiving equipment in the central location may be specific to that type of box. Therefore, the data coming from this equipment, which contain other upstream traffic, may be parsed in such a way that only the speech commands and address information from the subscriber are input to the speech recognition engine in the central location.

When the digitized speech signal sent upstream comes from another set-top appliance, the upstream data receiver in the central location may be a separate unit that receives only speech command signals from set-top appliances at the user sites. Using the set-top appliance as the upstream transmitter allows the use of custom upstream protocols such as FM, AM, PSK, or spread spectrum digital transmission. Digital transmission techniques such as QPSK or QAM can also be employed.

Upon receiving the digitized and preprocessed speech signal from the subscriber's set-top box or set-top appliance, the received upstream signal may be in the form of a data stream containing speech and address information. The data stream containing speech and address information may be Ethernet compatible. Because the AgileTV™ Voice Processing Unit (AVPU) is a high speed speech processing unit capable of processing the data from several nodes, the digital speech signals from each of these nodes may be combined in the AVPU input multiplexer. The combining of digital speech signals may result in a smaller number of high speed digital streams.

Upstream signals such as **1510** are received at the gateway **3100**. Speech and data signals may be received from commercial return path data receivers. Speech and data signals are also received and decoded by custom return

path receivers using at least one of the following protocol options: FM or AM modulation/demodulation, FDMA, TDMA, FSK, PSK, or QPSK digital modulation/demodulation, Spread Spectrum modulation/demodulation, Telephony, cellular return, or Wireless.

- 5 The AVPU Engine may not be an application service, in and of itself. The system may provide new end user applications. The AVPU Engine may provide speech recognition and control services for existing applications, such as Interactive Program Guides, Video On Demand (VOD) services or access to the Internet or World Wide Web.
- 10 Near network system initialization time, applications such as Video On Demand or Interactive Program Guides, that request service access with the speech recognition services may be required first to register with the AVPU system. At least one standard program interface may then be used to enable each application to specify its complete menu hierarchy. The invention may
- 15 use exactly one standard program interface to enable applications to specify their complete menu hierarchy.

A list structure specifies each application's menu hierarchy. This list structure may be a tree. It contains labels for each menu, along with the text of each button on each menu screen, information the system needs to provide speech

20 navigation services independently through the menu hierarchy on behalf of the application. This menu hierarchy represents the static portion of the application's data.

In addition to the static menu structure, it may also be the responsibility of the application to inform the system of dynamic content, for example the names of

25 movies in a Video On Demand system or of program names and times in an interactive program guide. Each time a user enters a menu context in which dynamic content appears, the application may inform the speech system of this context by passing a handle associated with the list of names that comprise the dynamic content. The speech system may combine the static

30 menu content with the augmented dynamic content (see Similarity Searching below), to form a complete grammar. Also, application-independent keywords,

such as HELP, may be combined with the static menu content and augmented dynamic content to form the complete grammar. This construct may then be passed to the speech system to maximize recognition accuracy.

Given that dynamic content, by definition varies, applications may be required
5 to inform the system whenever the content changes. In an interactive TV guide application, for example, the application registers a new set of dynamic content every one-half hour. For a VOD system, this registration may be performed whenever the database of offered movies changes.

Once registration has been completed, and the system is being used,
10 recognition of a spoken request may cause a signal to be sent back to the application. This signal informs the application to perform the requested action, and/or to update the contents of the screen as a result of the user's request. In this manner, the application can use the system's speech recognition services with minimal modifications to the application's code, while
15 retaining the same graphical look and feel to which users have become accustomed.

In the subscriber's premises, a speech-enabled remote control may be employed, e.g. containing a microphone, as well as traditional universal remote control functionality. The remote control may further contain a Push-
20 To-Talk (PTT) button. Conventional remote control functions are transmitted via infra-red (IR). The speech output may be wirelessly transmitted to a set top pod, module, or appliance located at the set-top box. The wireless transmission from the remote control may employ an electromagnetic physical transport layer or ultrasonic physical transport layer. The electromagnetic
25 physical transport layer may use a radio frequency carrier or an infra-red carrier.

When the PTT button is pushed by the user, the remote control sends a PTT active command to the set top appliance. The appliance may then inform the set-top box to place an icon on the screen, or otherwise indicate to the user
30 that the system is listening to them. Next, as the user speaks into the

microphone, the speech is digitized, compressed, and transmitted to the set top appliance.

The set top appliance may perform any or all of the following: encrypt the speech sample to provide security; add subscriber address information; add a message length code; add error control coding to the assembled information.
5 The error control coding may include a Cyclical Redundancy Code (CRC), enabling data transmission errors to be detected.

In homes with set-top boxes having the necessary features, the set top appliance may transmit speech information to the set-top box, which then
10 transmits it to the central location as a series of packets.

Alternatively, the set top appliance may directly transmit the speech stream to the central location itself. This may continue until the set top appliance receives a PTT Release from the remote, indicating end of speech. This information is also transmitted to the central location, signaling end of spoken
15 request.

Each individual consumer's interface, i.e. set-top box or set-top appliance, may have a unique address. The address of the individual consumer's interface may be determined during the manufacturing process. As speech packets are transmitted upstream, this address information may be appended
20 to the speech packets. The address information enables rapid determination of the user site from which the speech sample is received. The address information may precede the speech packets. The address information improves the efficiency of at least some of the central location processing stages.

25 Assignment of an input buffer address to the speech sample may be based upon the user site address. This input buffer collects incoming speech packets until the final packet of a spoken request has been received. Recognition of the final speech packet receipt may be encoded in that speech packet. Final speech packet receipt recognition may include a delay in speech
30 of greater than a predetermined amount of time. The speech delay amount may be one or more of at least the following: a globally defined constant, a

user site defined constant, an identified user defined constant, or an application-defined constant for an application serviced by the speech recognition system. The final speech packet may be generated based upon the release of the PTT button in the remote control unit. The final speech packet may be generated at the remote control unit, set top pod, set top appliance, set top box, node, Headend or metropolitan Headend, or by the serviced application. The final speech packet may be generated by the serviced application based upon a time schedule, e.g. a fixed period in which participants may respond, a privilege scheme, and/or other application related scheme.

On-the-fly Cyclical Redundancy Code (CRC) error checking generation may be used. Each time a packet is read in, CRC in the processor registers may be computed as each byte is read, then the partial CRC is stored with the stored packet. The CRC may be stored at the end of the packet, at the beginning of the packet or in specifically designated locations within the packet. When the next packet arrives, the partial CRC is read from where it was stored, and the new packet data may be appended to the end of the previous packet, overwriting the temporary CRC. This continues until a complete speech sample has been received. This approach to CRC calculation cuts memory accesses in half compared to first storing the string, then making a second pass to generate the CRC.

Once a complete spoken request has been received, the speech input processor may use the sample's source address identifying a user site to target the speech data to a specific speech processing processor. This direct correspondence between the source address and a specific speech processor allows speech processors to cache user-specific parameters for the user sites they serve. The mapping of source addresses to speech processor reduces the bandwidth necessary to move user site-specific data to each speech processor. In other embodiments of the invention, a translation table may be used to allow speech to processor assignments to be changed dynamically in the event of a hardware or other failure, e.g. capacity overload, while retaining

the efficiency advantages of directly mapping the speech channel to the processor.

To process a speech sample by the speech processor into speech content, the speech processor must first contain in its local memory a copy of the grammar definition associated with the user site. A grammar is a structure often containing the words which are most likely to be spoken, the order in which these words may appear, and the meaning of various sequences of words. This structure may be a hardware configuration, software program, data structure, or a combination of two or more of these.

Before transferring the new speech sample to a speech processor, the grammar associated with the speech sample is transferred to the target speech processor. The grammar transfer may use a simple Least Recently Used (LRU) queue. If the speech processor contains enough empty space in its memory, then the indicated grammar is transferred directly to the empty memory from mass storage. Mass storage may include, but is not limited to, a disk, disk farm, or Redundant Array of Independent Disks (RAID), a high bandwidth disk farm. If not, then the least-recently-used grammar entry may be discarded, and the new grammar information loaded into the vacated memory.

The next step in processing the speech sample ensures that the current parameters associated with this user site are already cached in the specific speech processor's RAM. If these parameters are not present, then the least-recently-used parameter cache entry may be evicted from the cache.

To do this, the oldest cache entry on this speech processor is first examined to see if it has been modified. If it has, the cache entry is stored to mass storage, and the cache slot is then declared vacant. Next, the user site speech parameters associated with the new speech sample are loaded into the vacated cache block. During the relatively long access times needed to load a new set of user site parameters from mass storage (and optionally to write the old parameters to the disk, etc.), the current speech sample may be held in the input buffer in a waiting state.

After the new household speech parameters are loaded into the targeted speech processor, the speech sample is moved into the work queue for the speech processor. This minimizes speech processor delay for processing other speech requests during disk accesses. Instead, the speech processor
5 may process other speech samples associated with user sites whose parameters are already in the cache.

Once the speech parameters associated with a speech sample are available in the speech processor, the speech sample may be assigned to the speech processor by placing a description of the speech sample into the target
10 speech processor's work queue. As speech samples are processed, they may be removed from the front of the work queue by the speech processor.

Eventually, the speech processor reaches the current input sample. The speech sample is transferred into the speech processor's local memory, and the status of this speech sample changed to Next. This transfer may occur in
15 parallel with the processing of the prior speech sample, ensuring that speech processor utilization is maximized.

Once this transfer is complete, and the speech processor completes processing of the prior sample, the status of this speech sample changes to Current, and the speech recognition engine begins processing this sample.

20 Successful processing of a speech sample requires that both the proper grammar and the proper user site parameter information be simultaneously accessible by the speech processor.

The possibility exists in which a recently-loaded grammar or speech parameter file is erased prior to its use, in the process of loading the grammar
25 or speech parameters for the current speech sample. To eliminate this condition, the total number of speech samples sitting in the waiting and working queues of a speech processor preferably should not exceed the number of cache entries in the speech processor.

The first step in recognizing the current speech sample may determine which
30 individual person pronounced the current spoken request. The Speaker

Identification software module running on the targeted speech processor compares the spoken characteristics of this speech sample with the characteristics of the speakers who have been previously identified in this user site.

- 5 In many spoken requests, the incoming speech sample matches the characteristics of a previously identified speaker. When this occurs, the speech sample is passed on to the next phase, speech recognition.

If the speech sample is not identified with an existing speaker, then a new user routine is invoked, enabling a new user to be associated with this household. This routine records the new individual's speech parameters into 10 this user site's speech parameters, so that the new speaker may be identified during subsequent spoken requests. Optionally, the system may offer the user site manager the opportunity to erase or modify the new speaker parameters.

The inputs to the speech recognition software module may include a speech 15 sample, an individual user's speech parameters, and the grammar to be recognized. The speech engine determines the most likely spoken request based on statistical analysis, and may return a text string corresponding to the spoken request. This matching process is probabilistic: along with the returned text string, the speech engine may also return a confidence 20 measure, or percentage of match likelihood. The returned text string and confidence measure enables different applications to respond differently based on the calculated confidence in the recognition result.

For recognition results having a low cost to the user, such as a request to display listings for a particular movie, lower confidence criteria may be 25 applied. For recognition results with a high cost to the user, such as a request to purchase a movie, higher confidence thresholds may be required. Furthermore, purchase verification may be requested.

When recognition accuracy is particularly low, the speech recognition engine may determine partial matches to more than one possible phrase, returning 30 the text of several possible matches. This process enables an application or user to select from several alternative recognition results.

In cases where a transaction results in a charge to the user, the system may record the speech sample representing the purchase request onto mass storage. This speech sample recording is performed to provide verification that a purchase request was made, should a user dispute their intent to purchase. This further supports speech-based methods of contracting. Note
5 that the recording may be compressed in either a standard or non-standard manner, which may further include encryption technology.

Due to the statistical nature of speech recognition, spoken requests are occasionally mis-recognized. Recognition errors have been a primary
10 hindrance to further exploitation of speech recognition systems. This system provides a mechanism by which the user receives rapid visual feedback regarding the recognition process. Soon after the speech recognition engine has returned a result, visual text corresponding to the recognized spoken request is displayed on the display, e.g. television, screen.

15 This rapid visual feedback may be accomplished by transmitting the recognized text string back to the set-top box. Software executing within the set-top box displays the text information in a special window on top or overlaying of the existing application display. In cases where limitations in the set-top box prevent the window from appearing on top of existing content,
20 software executing within the set-top box may select an alternative feedback display, for example, a different channel containing a background field, and displays the overlay information on top of this background.

In cases where the recognition accuracy is particularly poor, and the speech engine returns several possible recognition results, this overlay display
25 capability may be used to help refine the user's query. By displaying the text of the possible recognition results, the user can easily select from the returned list.

If none of the recognized text strings match the user's spoken request, the user may elect to start again. However, more commonly, one of the displayed
30 strings match, or be likely to readily lead to the user's speech request with appropriate modification. When this is the case, the user can readily select

from the displayed alternatives, enabling improved productivity in low-recognition situations.

One key feature which can be used with applications such as Pay-Per-View and Video-On-Demand, is similarity searching. When the system is scanning
5 for dynamic content, i.e. movie titles and actor names, a similarity search feature may be available. This enables searches for names which are only partially matched, or which resemble the recognized phrase, without requiring precise specification of the exact title or name. The technique used to deliver similarity searching is to augment the dynamic content list specified by the
10 application. Words similar in meaning, content, or spelling to words in the content list may be automatically added to the dynamic content list whenever the application informs the system of a content update. This enables the recognition grammar to be extended to support a broader array of matches without requiring bandwidth-intensive text searches each time a user's speech
15 request has been received. Links between similar and target words may be maintained in the internal representation of the grammar, thereby providing direct access to target names. This further enhances system performance.

Note that as used herein, similarity databases may be constructed from at least one or more of the following database architectures: relational, SQL,
20 knowledge-based, inferential knowledge bases including Horn clause and extended Horn clause fact bases, fuzzy versions of the above, as well as neural networks and combinations of these techniques. Also, manual additions may be made at the AgileTV™ central office.

The entire system may provide fault tolerance for robust performance. For
25 individual components, such as speech processors and associated memory, the system may automatically recognize most component failures, and disable faulty processors.

In addition, many system installations may require multiple AgileTV™ Voice Processing Unit (AVPU) boxes 3000 to meet the performance needs of the
30 subscriber base. To ensure maximum operating time, even the total failure of an AVPU engine may not be catastrophic. The remaining AVPU engines

continue to service the incoming speech traffic at a reduced performance level. This failover is carried out by a negotiation protocol between the AVPU boxes.

5 In addition to these internal diagnostics functions, the system may also communicate continuously with a network operations center, enabling rapid identification of system errors, as well as rapid service dispatch to correct any problems.

10 A speech command preprocessor may perform the function of speech filtering, digitizing, data compression, encoding pauses in speech, and address insertion. Preprocessing speech commands at user sites results in a lower upstream data rate. This processing can be located in the remote 1000, the Set-top appliance 1100, or the set top box.

15 A Speech Packet Processor may be centrally located in or near a wireline node specifically to capture and prepare the upstream speech packets that are to be fed to the Speech Recognition Engine.

20 A speech processor system may be centrally located in or near a wireline node, which may include a Cable Television (CATV) central location. The speech recognition system may be centrally located in or near a server farm. The speech recognition system may be centrally located in or near a web-site hosting location. The speech recognition system may be centrally located in or near a gateway.

The speech recognition engine processes speech packets to create speech content and formulate the response to the speech content for each of the user sites.

25 The system also performs address decoding for routing and latency reduction. It also performs the function of decoding the pauses between words or sounds originally encoded on the preprocessor at the user site.

A method is provided for a very high level of security based on the ability of being able to precisely recognize a parent's speech or a child's speech based

on a limited subset of choices. The ability to recognize an individual speaker with a very high probability of identifying the specific speaker is based on knowing the address of the user site.

5 A large capacity, centrally located, natural speech recognition engine can readily identify a specific speaker from among a small set of choices, allowing a parent to voice print and therefore control the type, or amount or timing of content a child may request. A child may be able to learn PIN numbers but cannot readily fool the voice print. Speaker recognition is particularly appealing in this parental control application, and can be applied with very
10 high accuracy, due to the limited number of speakers per user site. Parents may control the specific viewing times, total time, or content that a child can watch television through this system and its use.

The operational discussion just presented regarding Figures 3-5 is applicable to the relevant operational system embodiments based upon any and all of
15 the Figures 19A to 24, as well as, Figures 26 to 31.

A parallel processor system supporting this sort of system is disclosed in U.S. Patent Application Serial Number 60/210,440, entitled "System and Method of a Multi-dimensional Plex Communication Network", which describes plex processor networks and which is incorporated herein by reference.

20 A plex communications network has M orthogonal directions that support communications between an M dimensional lattice that may include N^M plex-nodes, where M is at least two and N is at least four. Each plex-node pencil in a first orthogonal direction contains at least four plex-nodes and each plex-node pencil in a second orthogonal direction contains at least two plex-
25 nodes. Each of the plex-nodes contains a multiplicity of ports.

A plex-node pencil refers to a 1-dimensional collection of plex-nodes differing from each other in only one dimensional component, i.e. the orthogonal direction of the pencil. By way of example, a nodal pencil in the first orthogonal direction of a two-dimensional array contains the plex-nodes
30 differing in only the first dimensional component. A nodal pencil in the second

orthogonal direction of a two-dimensional array contains the plex-nodes differing in only the second dimensional component.

The plex communications network is comprised of a communication grid interconnecting the plex-nodes. The communications grid may include $N^{(M-1)}$ communication pencils, for each of the M directions. Each of the communication pencils in each orthogonal direction is coupled with a corresponding plex-node pencil containing a multiplicity of plex-nodes coupling every pairing of plex-nodes of the corresponding plex-node pencil directly.

- 10 Communication between two plex-nodes of a nodal pencil coupled with the corresponding communication pencil comprises traversal of the physical transport layer(s) of the communication pencil.

Such plex communications networks support direct communication between any two plex-nodes belonging to the same communication pencil. This supports communication between any two plex-nodes in at most M hops between plex-nodes.

Figure 6 depicts a tightly coupled server farm 3000 of Figure 3 implemented in a two-dimensional plex communication network with $N=4$ plex-nodes in each of two orthogonal directions of the plex-node array.

- 20 Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,0, Plex-node 1,0, Plex-node 2,0 and Plex-node 3,0. The communication pencil 400 in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,0 is coupled 402 to communication pencil 400. Plex-node 1,0 is coupled 404 to communication pencil 400. Plex-node 2,0 is coupled 406 to communication pencil 400. Plex-node 3,0 is coupled 408 to communication pencil 400.

Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,1, Plex-node 1,1, Plex-node 2,1 and Plex-node 3,1. The communication pencil 410 in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,1 is coupled 412 to

communication pencil **410**. Plex-node 1,1 is coupled **414** to communication pencil **410**. Plex-node 2,1 is coupled **416** to communication pencil **410**. Plex-node 3,1 is coupled **418** to communication pencil **410**.

5 Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,2, Plex-node 1,2, Plex-node 2,2 and Plex-node 3,2. The communication pencil **420** in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,2 is coupled **422** to communication pencil **420**. Plex-node 1,2 is coupled **424** to communication pencil **420**. Plex-node 2,2 is coupled **426** to communication pencil **420**. Plex-
10 node 3,2 is coupled **428** to communication pencil **420**.

Consider the plex-node pencil in the first orthogonal direction containing Plex-node 0,3, Plex-node 1,3, Plex-node 2,3 and Plex-node 3,3. The communication pencil **430** in the first orthogonal direction couples to the plex-nodes of this plex-node pencil. Plex-node 0,3 is coupled **432** to
15 communication pencil **430**. Plex-node 1,3 is coupled **434** to communication pencil **430**. Plex-node 2,3 is coupled **436** to communication pencil **430**. Plex-node 3,3 is coupled **438** to communication pencil **430**.

Three of these ports on each plex-node are devoted to providing a direct interconnect to the other plex-nodes of its row through a collection of
20 communication paths forming the communication pencil in the second orthogonal direction. These plex-nodes belong to the same row as the plex-nodes of the plex-node pencil in the second orthogonal direction.

A plex-node may have at least one additional port. At least one of the additional ports may be connected to an external network. Further, at least
25 one of the additional ports may be connected to an external mass storage system. In other embodiments of the invention, at least one of the additional ports may be connected to an external database system.

A plex-node may contain at least one instruction processor. As used herein, an instruction processor includes but is not limited to instruction set
30 processors, inference engines and analog processors. An instruction set processor refers to instruction processors changing state directly based upon

an instruction, and which change an internal state by executing the instruction. The instruction may include, but is not limited to, direct or native instructions and interpreted instructions. An inference engine changes state when presented an instruction, which may include an assertion, an
5 assumption, or an inference rule. Inference engines include, but are not limited to, Horn clause engines such as Prolog requires, constraint based systems and neural network engines. As referred to herein, analog processors include, but are not limited to, optical signal processors, CCD's, and resonant cavity devices responding to data and/or controls asserted in
10 the analog domain.

Communication includes, but is not limited to, communication using a digital communications protocol. Communication also includes a messaging protocol using the digital communications protocol. Communications also includes a messaging protocol supporting TCP-IP, supporting the Internet, and/or
15 supporting the World Wide Web.

Communications may also include at least one video stream protocol using a digital communications protocol. Communications may include at least one multi-media stream protocol using the video stream protocols including motion JPEG and/or at least one form of MPEG.

20 The invention may support Wavelength Division Multiplex (WDM) through the physical transport of the communication paths of the communication pencils.

Each plex-node may include a communication processor. Each plex-node may further include M communications processors. The ports of each communications processor may be connected to each one of the pencils
25 supporting pencil communications processing.

Figure 7 depicts a gateway 3100 of Figure 3 implemented in a two-dimensional plex communication network with N=4 plex-nodes in each of two orthogonal directions of the plex-node array.

In Figures 6 and 7, upstream signals 1510 may be received at the Plex-node
30 0,0, performing functions similar in nature to processor node 3110 of Figures

3, 4 and 5. Plex-node 0,1 may couple **3142** to RAID **3130** subsystem, providing high-speed access to a high capacity disk farm. Various signals **1512** to **1518** may be generated by various plex-nodes. Note that because of the uniformity of the communication structure, there is great flexibility in
5 choosing which plex-node generates which communication signals.

Figure 7 also shows coupling **3002** to a speech recognition server array **3200**.

Figure 8 depicts a coupled server array **3200** of Figure 3 implemented in a two-dimensional plex communication network with N=4 plex-nodes in each of two orthogonal directions of the plex-node array.

10 Each plex-node of Figure 8 may include a plex communications network supporting a two or more dimensional array of internal plex-nodes, each including at least one instruction processor.

Figure 9 depicts a simplified block diagram using an array of processors as shown as **3200** in Figure 3.

15 Consider an array of plex-nodes, where each plex-node uses multiple-processor IC's labeled **CPU**. Each CPU may possess three or more high speed serial protocol channels **C1-3**, a high speed interconnect bus **B1**, a low speed interconnect bus **PCI** and a local memory access bus **R**. Each CPU may include at least two processors. Each processor may be an instruction
20 processor. Each CPU may be an integrated circuit. The integrated circuit may be a BCM12500 manufactured by Broadcom Corporation of Irvine, California.

CPU1 and **CPU2** are locally coupled via at least one of the interconnect buses. Each CPU possesses locally accessible memory via an **R** bus. Each CPU may further access locally accessible memory via its own **R** bus. The **R**
25 bus accessed memory may include DDR SDRAM (Double Data Rate Synchronous DRAM).

Three serial protocol channels for the first CPU of each CPU pair are dedicated to communication within each row of CPU pairs. Three serial

protocol channels for the second CPU of each CPU pair are dedicated to communication within each column of CPU pairs.

Assume each CPU contains at least two processors. Assume each processor is operating at K billion integer operations/second and L billion floating point operations/second. Assume the high speed serial channels support a gigabit/second bidirectional transfer rates. The DDR DRAMs support M gigabyte/second access rates. This system provides $64 \times K$ billion integer operations, $64 \times L$ billion floating point operations, 128 gigabits/second interconnect communication bandwidth throughout the array through the high speed serial channels, as well as $64 \times M$ gigabytes/second local memory access. By decoupling the tasks running on each processor, making them independent and concurrent, this system architecture achieves the dream of Multiple-Instruction Multiple Datapath computing (MIMD), providing essentially linear speed up with the increase in processors for up to 64 processors.

Such architectures can support each processor generating a frame in a local frame buffer and rendering it into a motion video stream, which is merged into a multiplexed video content stream suitable for a variety of multi-media applications. This apparatus meets or exceeds the requirements of a number of teraflop-class computing applications, which today have no cost effective solution. Note that the processors may each be dual instruction processors housed in a single package.

Each of these arrays will process over 1K speakers concurrently and fit into a single rack mount enclosure. Standard 72 inch, tall racks could then hold 4 such speech engines, also known herein as an AVPU, supporting up to 140,000 subscribers. Each server contains at least dual, redundant, hot-swappable power supplies, and redundant, hot-swappable disks with automatic recovery for failed disk drives. The hot-swappable power supplies may further be half-sized, each supporting the power requirements of half the server engine.

Real-time, extensive diagnostics and continuous connectivity to a 24 hours per day, seven days per week (24x7) Network Operations Center insuring

timely failure detection and service dispatch. In systems with more than one speech engine, the server automatically handles catastrophic failures gracefully. Even if an entire speech engine fails, the remaining ones pick up the workload.

- 5 Figure 10 depicts a flowchart of a method that uses a back channel containing a multiplicity of identified speech channels for speech recognition at a wireline node in a network supporting video or cable television delivery in accordance with the invention. The back channel is from a multiplicity of user sites and is presented to a speech processing system at the wireline node in the network.
- 10 The speech processing system performs the operations of the method.

Operation 2000 starts the operations of this flowchart. Arrow 2002 directs the flow of execution from operation 2000 to operation 2004. Operation 2004 performs receiving the back channel to create a received back channel. Arrow 2006 directs execution from operation 2004 to operation 2008.

- 15 Operation 2008 terminates the operations of this flowchart.

Arrow 2010 directs the flow of execution from starting operation 2000 to operation 2012. Operation 2012 performs partitioning the received back channel into a multiplicity of received identified speech channels. Arrow 2014 directs execution from operation 2012 to operation 2008. Operation 2008

20 terminates the operations of this flowchart.

- Arrow 2020 directs the flow of execution from starting operation 2000 to operation 2022. Operation 2022 performs processing the multiplicity of the received identified speech channels to create a multiplicity of identified speech content. Arrow 2024 directs execution from operation 2022 to
- 25 operation 2008. Operation 2008 terminates the operations of this flowchart.

- Arrow 2030 directs the flow of execution from starting operation 2000 to operation 2032. Operation 2032 performs responding to the identified speech content to create an identified speech content response, for each of the multiplicity of the identified speech contents. Arrow 2034 directs execution
- 30 from operation 2032 to operation 2008. Operation 2008 terminates the operations of this flowchart.

Portions of the flowchart of Figure 10 related to operations 2022 and 2032 may operate a speech processing system coupled to a wireline node in a network. The wireline node provides multiple received identified speech channels to the speech processing system. The received identified speech channels are based upon a received back channel at the wireline node from multiple user sites coupled to the network. The network supports video delivery to the user sites and/or cable television delivery to the user sites.

The speech processing system may include at least one computer. Operations 2022 and 2032 may be implemented as program steps of a program system operating at least part of the computers included in the speech processing system. Implementations of these operations as program steps may reside in memory accessibly coupled to at least one computer in the speech processing system.

Note that operations 2002 and 2012 may be implemented in hardware and/or implemented as program steps used in operating computers located at the wireline node. Such computers may or may not be part of the speech processing system.

At least one, and possibly all, of the identified speech channels may have an associated user site.

Figure 11A depicts a detail flowchart of operation 2012 of Figure 10 further partitioning the received back channel.

Arrow 2070 directs the flow of execution from starting operation 2012 to operation 2072. Operation 2072 performs partitioning the received back channel into a multiplicity of received identified speech channels from the associated user site. Arrow 2074 directs execution from operation 2072 to operation 2076. Operation 2076 terminates the operations of this flowchart.

Figure 11B depicts a detail flowchart of operation 2022 of Figure 10 further processing the multiplicity of the received identified speech channels.

Arrow **2090** directs the flow of execution from starting operation **2022** to operation **2092**. Operation **2092** performs processing the multiplicity of the received identified speech channels from the associated user site to create multiple identified speech contents. Arrow **2094** directs execution from operation **2092** to operation **2096**. Operation **2096** terminates the operations of this flowchart.

Figure **11C** depicts a detail flowchart of operation **2032** of Figure **10** further responding to the identified speech content.

Arrow **2110** directs the flow of execution from starting operation **2032** to operation **2112**. Operation **2112** performs responding to the identified speech content from the associated user site to create the identified speech content response for the associated user site. Arrow **2114** directs execution from operation **2112** to operation **2116**. Operation **2116** terminates the operations of this flowchart.

Figure **12** depicts a detail flowchart of operation **2000** of Figure **10** further performing the method using the back channel from multiple user sites.

Arrow **2120** directs the flow of execution from starting operation **2000** to operation **2122**. Operation **2122** performs determining the associated user site from the received identified speech channel. Arrow **2124** directs execution from operation **2122** to operation **2126**. Operation **2126** terminates the operations of this flowchart.

Arrow **2130** directs the flow of execution from starting operation **2000** to operation **2132**. Operation **2132** performs determining the associated user site from the identified speech content. Arrow **2134** directs execution from operation **2132** to operation **2126**. Operation **2126** terminates the operations of this flowchart.

Arrow **2140** directs the flow of execution from starting operation **2000** to operation **2142**. Operation **2142** performs determining the associated user site from the identified speech content and a speaker identification library.

Arrow **2144** directs execution from operation **2142** to operation **2126**. Operation **2126** terminates the operations of this flowchart.

Arrow **2150** directs the flow of execution from starting operation **2000** to operation **2152**. Operation **2152** performs determining the associated user
5 site from the identified speech content and a speech recognition library. Arrow **2154** directs execution from operation **2152** to operation **2126**. Operation **2126** terminates the operations of this flowchart.

Arrow **2160** directs the flow of execution from starting operation **2000** to operation **2162**. Operation **2162** performs determining the associated user
10 site from an identification within the speech channel. Arrow **2164** directs execution from operation **2162** to operation **2126**. Operation **2126** terminates the operations of this flowchart.

Note that the determination of the associated user site may be provided by an identification within the speech channel. By way of example, a technician
15 may be recognizable at many user sites, and may identify the user site as Room 432 or 10 Main Street in the process of activities at that user site.

The invention can include at least one of the operations **2120**, **2132**, **2142**, **2152** and **2162**.

Figure **13A** depicts a detail flowchart of operation **2112** of Figure **11C** further
20 responding to identified speech contents.

Arrow **2170** directs the flow of execution from starting operation **2112** to operation **2172**. Operation **2172** performs processing the identified speech content response to create the identified user site response. Arrow **2174** directs execution from operation **2172** to operation **2176**. Operation **2176**
25 performs sending the identified user site response to the identified user site. Arrow **2178** directs execution from operation **2176** to operation **2180**. Operation **2180** terminates the operations of this flowchart.

Figure **13B** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content.

Arrow **2190** directs the flow of execution from starting operation **2112** to operation **2192**. Operation **2192** performs assessing the speech content response identified as to the user site to create a financial consequence identified as to the user site. Arrow **2194** directs execution from operation **2192** to operation **2196**. Operation **2196** performs billing the user site based upon the financial consequence. Arrow **2198** directs execution from operation **2196** to operation **2200**. Operation **2200** terminates the operations of this flowchart.

Figure **14** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2210** directs the flow of execution from starting operation **2112** to operation **2212**. Operation **2212** performs assessing the speech response to create a financial consequence identified as to the user site. Arrow **2214** directs execution from operation **2212** to operation **2216**. Operation **2216** performs displaying the financial consequence to create a displayed financial consequence at the user site. Arrow **2218** directs execution from operation **2216** to operation **2220**. Operation **2220** performs confirming the displayed financial consequence from the user site to create a financial commitment. Arrow **2222** directs execution from operation **2220** to operation **2224**. Operation **2224** performs billing the user site based upon the financial commitment. Arrow **2226** directs execution from operation **2224** to operation **2228**. Operation **2228** terminates the operations of this flowchart.

Figure **15A** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2250** directs the flow of execution from starting operation **2112** to operation **2252**. Operation **2252** performs identifying a user based upon the speech content identified with the user site to create an identified user. Arrow **2254** directs execution from operation **2252** to operation **2256**. Operation **2256** terminates the operations of this flowchart.

Figure **15B** depicts a detail flowchart of operation **2252** of Figure **15A** further identifying the user.

Arrow **2270** directs the flow of execution from starting operation **2252** to operation **2272**. Operation **2272** performs fetching a user profile list based upon the user site and the user profile list containing at least one user profile. Arrow **2274** directs execution from operation **2272** to operation **2276**.
5 Operation **2276** performs identifying the user based upon the speech content and based upon the user profile list to create an identified user. Arrow **2278** directs execution from operation **2276** to operation **2280**. Operation **2280** terminates the operations of this flowchart.

10 Figure **16** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2290** directs the flow of execution from starting operation **2112** to operation **2292**. Operation **2292** performs assessing the speech response based upon the identified user to create a financial consequence for the identified user. Arrow **2294** directs execution from operation **2292** to
15 operation **2296**. Operation **2296** performs displaying the financial consequence to create a displayed financial consequence at the user site. Arrow **2298** directs execution from operation **2296** to operation **2300**. Operation **2300** performs confirming the displayed financial consequence from the user site based upon the identified user to create a financial
20 commitment. Arrow **2302** directs execution from operation **2300** to operation **2304**. Operation **2304** performs billing the identified user based upon the financial commitment. Arrow **2306** directs execution from operation **2304** to operation **2308**. Operation **2308** terminates the operations of this flowchart.

25 Figure **17A** depicts the speech content response **2350**, including the current response menu **2352** and the cumulative user site response **2354**, in accordance with the invention.

The speech content response may include a current response menu and a cumulative user site response identified as to the user site for at least one of the user sites.

30 Figure **17B** depicts a detail flowchart of operation **2112** of Figure **11C** further responding to the identified speech content from the associated user site.

Arrow **2330** directs the flow of execution from starting operation **2112** to operation **2332**. Operation **2332** performs responding to the speech contents based upon the current response menu and based upon the cumulative user site response to create a new cumulative user site response. Arrow **2334**
5 directs execution from operation **2332** to operation **2336**. Operation **2336** terminates the operations of this flowchart.

Arrow **2340** directs the flow of execution from starting operation **2112** to operation **2342**. Operation **2342** performs assessing the speech contents based upon the current response menu and based upon the cumulative user
10 site response to create a new current response menu. Arrow **2344** directs execution from operation **2342** to operation **2336**. Operation **2336** terminates the operations of this flowchart.

At least one of operations **2332** or **2342** may be performed.

Figure **18A** depicts a detail flowchart of operation **2112** of Figure **11C** further
15 responding to the identified speech content from the associated user site.

Arrow **2370** directs the flow of execution from starting operation **2112** to operation **2372**. Operation **2372** performs responding to the speech content, identified as to the user site, based upon a natural language, to create a speech content response of the speech content identified as to user site.
20 Arrow **2374** directs execution from operation **2372** to operation **2376**. Operation **2376** terminates the operations of this flowchart.

Figure **18B** depicts a detail flowchart of operation **2092** of Figure **11B** further processing the multiplicity of the received speech channels.

Arrow **2390** directs the flow of execution from starting operation **2092** to operation **2392**. Operation **2392** performs processing the received speech channels from the user site based upon a natural language for the user site to create the speech content identified as to the user site. Arrow **2394** directs execution from operation **2392** to operation **2396**. Operation **2396** terminates the operations of this flowchart.
25

Figure **19A** depicts a simplified block diagram of a hand held remote **1000**, containing microphone **1060** and keypad **1020** supporting user input organized and processed by embedded controller **1050** for communication by wireless interface **1040** coupled **1002** to set-top apparatus **1100**, as shown in Figure 3.

Figure **19B** depicts a simplified block diagram of set-top apparatus **1100** as shown in Figure 3 showing coupling **1002** and first wireline physical transport **1200** comprised of downlink coupling **1202** and uplink coupling **1204**.

Note that microphone **1060** may include more than one audio-sensor and/or a microphone array of two or more microphone units.

Figure **19C** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000**. Set-top appliance **1120** is coupled **1112** with set-top box **1110** possessing downlink coupling **1202** and uplink coupling **1204**.

Figure **19D** further depicts set-top apparatus **1100** as shown in Figure **19B** containing a set-top appliance **1120** coupled **1002** with hand held remote **1000** and possessing downlink coupling **1202** and uplink coupling **1204**. Set-top appliance **1120** provides processed downlink coupling **1114** to set-top box **1110** and receives initial uplink coupling **1112** from set-top box **1110**.

Regarding Figure **19A-19D**, the following observations may be made.

The invention supports uni-directional communication via coupling **1002**, supporting communicative transfer from the remote **1000** via coupling **1002** to set-top apparatus **1100**.

The invention supports bi-directional communication via coupling **1002**. Note that noise-canceling microphones **1060** may use bi-directional communication on coupling **1002**. Noise cancellation may be performed within set-top apparatus **1100**, by at least one of the set-top box **1110** and set-top appliance **1120**.

Wireless interface **1040** interacts with coupling **1002**. Coupling **1002** may use a wireless transport, including, but not limited to, at least one of infra-red, microwave or radio frequency spectrum regions, as well as ultrasonic signaling. Embedded controller **1050** controls **1042** wireless interface **1040**.

- 5 Embedded controller **1150** communicates via **1042** with wireless interface **1040** to direct communication across coupling **1002**.

Figure **20A** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19C** supporting coupling **1002** with hand held remote **1000** and coupling **1112** with set-top box **1110**.

- 10 Computer **1150** is coupled **1132** to remote interface **1130** and also coupled **1142** to set-top box interface **1140**. Computer **1150** executes a program system including program steps residing in accessibly coupled **1162** memory **1160**.

- The program system executed by computer **1150** includes program steps
15 maintaining hand held remote **1000** communication through remote interface **1130** and maintaining set-top box **1120** communication through set-top box interface **1140**.

Remote interface **1130** couples **1002** with hand held remote **1000** (not shown in Figure **20A**).

- 20 Remote interface **1130** incorporates the necessary device or devices to provide communications using the embodiment's physical transport layer.

- Set-top box interface **1140** couples **1112** with set-top box **1120**, as shown in Figure **19C**. Coupling **1112** may use a wireline or wireless physical transport. Coupling **1112** may use a wireless transport, including, but not limited to, at
25 least one of the infra-red, microwave or radio frequency spectrum, as well as ultrasonic signaling. Set-top box interface **1140** incorporates the necessary device or devices to provide communications using the embodiment's physical transport layer.

Figure **20B** depicts a simplified block diagram of set-top appliance **1120** as shown in Figure **19D** supporting coupling **1002** with hand held remote **1000** and couplings **1112** and **1114** with set-top box **1110**.

Set-top box interface **1140** provides processed downlink coupling **1114** to set-top box **1110** and receives initial uplink coupling **1112** from set-top box **1110** as shown in Figure **19D**. Set-top box interface **1140** incorporates the necessary device or devices to provide these communications.

Figure **20C** depicts a block diagram further depicting accessibly coupled **1162** memory **1160** as shown in Figures **20A** and **20B**.

10 Accessibly coupled **1162** memory **1160** may contain RAM memory **1180** coupled **1182** to computer **1150**. Accessibly coupled memory **1160** may include more than one RAM memory **1180**. Distinct RAM memories **1180** may be distinctly coupled to computer **1150**. One or more RAM memories **1180** may act as a cache memory for computer **1150**.

15 Accessibly coupled **1162** memory **1160** may contain non-volatile memory **1190** coupled **1192** to computer **1150**. Accessibly coupled memory **1160** may include more than one non-volatile memory **1190**. Distinct non-volatile memories **1190** may be distinctly coupled to computer **1150**. A non-volatile memory may be organized as file management system.

20 Note that the coupling **1182** of RAM memory **1180** may be distinct from coupling **1192** of non-volatile memory **1190** with computer **1150**. Either RAM memory and/or non-volatile memory components may be packaged with computer **1150**.

Figure **21** depicts a remote control unit **1000-180** coupled **1002-180** to set-top apparatus **1100-180**. Set-top appliance **1100-180** communicates via a one- or two-stage wireline communications system containing a wireline physical transport **1200** to an augmented distributor node **1310**. The communications traverse augmented distributor node **1310** interfaced to a wireline communications loop including an augmented Headend **1410**. The network

may further support a communications loop including augmented metropolitan Headend **1410**.

As used herein, the adjective augmented is used to refer to a node incorporating at least one embodiment of the invention.

5 Augmented node **1310** may control and support optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled "Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems" by Calderone and Foster, both inventors of this application and commonly assigned to AgileTV, and incorporated herein
10 by reference.

Augmented node **1310** may provide cached content such as popular videos for a VOD service.

Speech processing may be performed in many situations at augmented node **1310**.

15 Augmented Headend **1410** and augmented metropolitan Headend **1410** provide speech processing capabilities. Augmented Headend **1410** may be used to handle speech processing for nodes **120** and **124**. Augmented metropolitan Headend **1410** may be used to handle speech processing for Headends **100** and **106**. Headends **100** and **106**, and nodes **120** and **124** are
20 not augmented by this invention.

Alternatively, augmented Headend **1410** may control the optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled "Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems". Node **1310** may support the optimized
25 upstream communication. Upstream communication from augmented node **1310** and from augmented Headend **1410** may employ the same upstream communications protocol, or different upstream communications protocol.

Note that metropolitan Headend **1410** may not be involved in the optimized upstream communication scheme.

Alternatively, metropolitan Headend **1410** may be involved in the optimized upstream communication scheme. Augmented metropolitan Headend **1410** may further control the optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled "Increased
5 Bandwidth in Aloha-based Frequency Hopping Transmission Systems". Augmented Headend **1410** may support the optimized upstream communication between node **1310** and set-top apparatus **1100-180**. Node **1310** may then carry out the optimized upstream communication. Upstream communication from augmented node **1310** and from augmented Headend
10 **1410** may employ the same upstream communications protocol, or different upstream communication protocols.

Note that in certain network installations, there may be no metropolitan Headend, augmented or otherwise. Further, in certain network installations, there may only be one Headend.

15 Figure 22 depicts a remote control unit **1000-180** coupled **1002-180** to set-top apparatus **1100-180**, communicating via a two-stage wireline communications system containing a wireline physical transport **1200** to a distributor node **126**. Distributor node **126** interfaces to a wireline communications loop including an augmented Headend **1414**. The network may further support a
20 communications loop including augmented metropolitan Headend **1410**, in accordance with the invention.

Augmented Headend **1414** may control and support optimized upstream communication as disclosed in the co-pending application serial number
25 09/679,115, entitled "Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems" by Calderone and Foster, both inventors of this application and commonly assigned to AgileTV, incorporated herein by reference.

Augmented Headend **1414** may provide cached content such as popular
30 videos for a VOD service. Speech processing may be performed in many situations at augmented Headend **1414**

Augmented metropolitan Headend **1410** may further provide speech processing capabilities. Augmented metropolitan Headend **1410** may be used to handle speech processing requirements for Headends **100** and **106**, which are not augmented by this invention.

- 5 The couplings between STB **1100-180**, Node **126** and Headend **1410** may also support bi-directional communication allowing the STB **1100-180** to receive multiple television channels and allowing STB **1100-180** to signal at least limited information to augmented Headend **1410**, which may well include management of Pay-per-View and other services.
- 10 Alternatively, augmented metropolitan Headend **1410** may control the optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems. Augmented Headend **1414** may then support the optimized upstream communication. Upstream
- 15 communication from augmented node **126** and from augmented Headend **1410** may employ the same upstream communications protocol, or a different upstream communications protocol.

Note that metropolitan Headend **1410** may not be involved in the optimized upstream communication scheme.

- 20 Alternatively, metropolitan Headend **1410** may be involved in the optimized upstream communication scheme. Augmented metropolitan Headend **1410** may further control the optimized upstream communication as disclosed in the co-pending application serial number 09/679,115, entitled Increased Bandwidth in Aloha-based Frequency Hopping Transmission Systems.
- 25 Augmented Headend **1410** may support the optimized upstream communication between node **126** and set-top apparatus **1100-180**. Node **126** may then carry out the optimized upstream communication. Upstream communication from node **126** and from augmented Headend **1410** may employ the same upstream communications protocol, or different upstream
- 30 communication protocols.

Note that in certain network installations, there may be no metropolitan Headend, augmented or otherwise. Further, in certain network installations, there may only be one Headend.

Figure 23 depicts a detail block diagram of an augmented distributor node
5 1310, coupled to wireline physical transport 1200 and coupled to the wireline communications loop of Figure 21.

Note that there may be one transport 1200. Transceiver 1320 couples to transport 1200 to provide uplink 1204 and downlink 1202 communications between STB's 1100 of Figure 21.

10 There may be multiple transports 1200 corresponding to wireline circuits servicing combinations of at least one of the interfaces 170, 174 and 178, as shown in Figures 1, 2, 21 and 22. Transceiver 1320 couples to transport 1200 to provide uplink 1204 and downlink 1202 communications between STB's 1100 of Figures 21 and 22. Note that transceiver 1320 may provide multiple
15 uplinks 1204. Transceiver 1320 may provide multiple downlinks 1202.

Transceiver 1320 may include transmitter 1324 providing downlink 1202 communications to wireline physical transport 1200. Multiple downlinks 1202 may be provided by transmitter 1324. Alternatively, multiple downlinks 1202 may be provided by more than one transmitter 1324.

20 Transceiver 1320 may include receiver 1322 providing uplink 1204 communications from wireline physical transport 1200. Multiple uplinks 1204 may be provided by receiver 1322. Alternatively, multiple uplinks 1204 may be provided by more than one receiver 1322.

Wireline physical transport 1200 may further include separate uplink physical
25 transport 1204 and downlink physical transport 1202. Various embodiments of the invention may include multiple uplink physical transports 1204. Various embodiments of the invention may include multiple downlink physical transports 1202. There may be a difference in the number of uplink physical transports 1204 and the number of downlink physical transports 1202.

Note that there may be a difference in the number of transmitters **1324** and the number of receivers **1322**.

By way of example, referring to Figure **21**, one downlink stream **1202** may be sent to interface **170**, and a second downlink stream, not shown in Figure **21** or Figure **23**, may be sent to interface **174**. One uplink stream **1204** may be received from interface **170**, and a second uplink stream, not shown in Figure **21** or Figure **23**, may be received from interface **174**.

Hereafter, the discussion focuses on a single transmitter **1324** providing as many downlinks **1202** and on a single receiver **1322** providing as many uplinks **1204** as required. This is done strictly to simplify the discussion and is not meant to imply any limitation on the invention.

Uplink **1204** communication includes a back channel. This back channel includes multiple identified speech channels from multiple user sites (STBs) **1100**, as shown in Figures **21** and **22**. Receiver **1322** provides **1326** a back channel to speech engine **1330**. Speech engine **1330** performs at least the operations of Figure **10**.

Speech engine **1330** further communicatively interacts **1374** with network interface **1370**. Network interface **1370** couples **1372** to other network components. Network coupling **1372** may further include a predominantly input coupling **1306** and a predominantly output coupling **1308**.

Network interface **1370** may communicatively interact **1376** with local system management and billing **1380**. Local system management and billing **1380** may include systems management and billing data relevant to the elements of the overall network managed or controlled through the local node.

Local system management and billing **1380** may further maintain systems management and billing data relevant to the elements of the overall network managed or controlled through the local node.

Local system management and billing **1380** may include a cache of systems management and billing data relevant to the elements of the overall network managed or controlled through the local node.

Receiver **1322** provides **1326** a back channel to speech engine **1330**.

5 Speech engine **1330** performs at least the operations of Figure 10. Speech engine **1330** further communicatively interacts **1374** with network interface **1370**.

Speech engine **1330** may communicatively interact **1382** with system management and billing **1380**. Speech engine **1330** may send **1382** system management and billing **1380** requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits, and parental safeguards. Speech engine **1330** may send **1382** system management and billing **1380** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech engine **1330** may receive **1382** from system management and billing **1380** credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech engine **1330** may receive **1382** from system management and billing **1380** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions with network interface **1370** or other external communications networks **1312**.

System management and billing **1380** may further include interfaces to other external communications networks. Such circuitry is not the subject of this invention and is not discussed further herein.

Similarly, the mechanism of contract acceptance between system management and billing **1380** and financial engines is not the subject of this invention and is not discussed further herein.

Speech engine **1330** may receive **1338** from content engine **1340** content status information. Content status information may include a list of available

services through the coupled network(s). Content status information may further include a list of services available within the node.

Content status information may include a list of content items cached through the network. Content status information may further include a list of content
5 items cached at the node. Cached content items may include Interactive Program Guide (IPG) listings for some period of time. Cached content items may include one or more video sequences provided through Video On Demand (VOD) or Pay-Per-View services.

Content engine **1340** communicatively interacts **1378** with network interface
10 **1370**. Content engine **1340** may provide at least one locally generated multi-media stream **1342** to Multiplexor engine **1360** as well as at least one multi-media stream **1344** received **1378** through network interface **1370**. Content engine **1340** may modify multi-media stream **1344** received **1378** from network interface **1370** through network input **1306**. Content engine **1340**
15 may stimulate **1378** network interface **1370**, altering network output **1308** from network interface **1370**.

Content engine **1340** may have more than one registered application server each presenting static menu content and dynamic content. A speech processor within speech engine **1330** may be presented a grammar based
20 upon the static and dynamic content of multiple registered application servers. The merged services may be presented to the users as specialized, multi-application service menus provided by the speech engine **1330** to the users.

Speech engine **1330** may generate one or more channels of speech response content through coupling **1332** to modulator engine **1350**. Modulator engine
25 **1350** may further provide **1334** status and reliability information to speech engine **1330**. Speech response content channels presented through coupling **1332** may be digital. Speech response content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1332** by speech engine
30 **1330**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing. Modulator engine **1350** may demultiplex multiple

multiplexed channels received through coupling **1332**. Modulator engine **1250** may convert one or more demultiplexed channels into modulated channels, or modulated collections of channels, presented **1352** and **1354** to multiplexor engine **1360**.

- 5 Multiplexor engine **1360** accepts the multiple locally generated channels **1352**, **1354** and **1342** as well as the locally received, and possibly modified, external stream **1344** to create at least one merged stream **1362**. Multiplexor engine **1360** may create more than one merged stream, e.g. **1364**.

- 10 Transmitter **1324** receives at least one merged stream **1362** from multiplexor engine **1360** to generate at least one downlink stream **1202** of physical transport **1200**. Transmitter **1324** may receive more than one merged stream **1364** from multiplexor engine **1360**.

- Speech engine **1330** may further interact **1312** with an external network. Such an interaction may involve at least one wireline physical transport layer.
- 15 The wireline physical layer may support at least one or a combination of communication protocols using optical, infra-red and radio frequency regions of the electromagnetic spectrum. Network interactions **1312** may support message passing protocols, including, but not limited to, TCP-IP. Network interactions **1312** may further support communications with the Internet and
- 20 World Wide Web.

Figure **24** depicts an alternative detail block diagram of an augmented distributor node **1310**, coupled to wireline physical transport **1200** and coupled to the wireline communications loop of Figure **21**.

- Receiver **1322** provides a back channel to speech engine **1330** through
- 25 interactions **1328** with switch **1390** delivering **1392** the back channel to speech engine **1330**.

Speech engine **1330** communicatively interacts **1374** with network interface **1370** by the speech engine **1330** interacting **1392** with switch **1390** which interacts **1398** with network interface **1370**.

Network interface **1370** may communicatively interact with local system management and billing **1380** by communicatively interacting **1398** with switch **1390**, which communicatively interacts **1396** with system management and billing **1380**.

- 5 Speech engine **1330** may communicatively interact **1382** with system management and billing **1380** by communicatively interacting **1392** with switch **1390**, which communicatively interacts with system management and billing **1380**.

- 10 Speech engine **1330** may receive content status information from content engine **1340** by content engine **1340** interacting **1394** with switch **1390**, which delivers **1392** the content status information to speech engine **1330**.

Content engine **1340** communicatively interacts with network interface **1370** by content engine **1340** communicatively interacting with switch **1390** and network interface **1370** communicatively interacting with switch **1390**.

- 15 Switch **1390** may support digital interfaces. Switch **1390** may include a circuit switch. The circuit switch may support Ethernet protocols. Switch **1390** may include an ATM switch. Switch **1390** may support analog interfaces. Such analog interfaces may include wavelength division multiplexing. Switch **1390** may be composed of more than one switch.

- 20 The invention may include various combinations of direct interconnections and switch networks as shown in Figures **23** and **24**.

Figure **25** depicts a generic block diagram of a prior art Headend **104** as shown in Figure **3**.

Uplink **138** communication includes a back channel.

- 25 This back channel includes multiple response channels from multiple user sites STBs, as shown in Figures **1** and **2**. Receiver **1422** provides **1427** a back channel to content engine **1440**.

Network interface **1470** may communicatively interacts **1476** with Headend system management and billing **1480**. Headend system management and billing **1480** may include systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend.

- 5 Headend system management and billing **1480** may further maintain systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend.

Headend system management and billing **1480** may include a cache of systems management and billing data relevant to the elements of the overall
10 network managed or controlled through the Headend.

System management and billing **1480** may further include interfaces to other external communications networks. Such circuitry is not the subject of this invention and is not discussed further herein.

Content status information may include a list of content items cached through
15 the network. Content status information may further include a list of content items cached at the node. Cached content items may include Interactive Program Guide (IPG) listings for some period of time. Cached content items may include one or more video sequences provided through Video On Demand (VOD) or Pay-Per-View services.

20 Content engine **1440** communicatively interacts **1478** with network interface **1470**. Content engine **1440** may provide at least one locally generated multi-media stream **1442** to Multiplexor engine **1460** as well as at least one multi-media stream **1444** received **1478** through network interface **1470**. Content engine **1440** may modify multi-media stream **1444** received **1478** from
25 network interface **1470** through network input **1406**. Content engine **1440** may stimulate **1478** network interface **1470**, altering network output **1408** from network interface **1470**.

Content engine **1340** may include, but is not limited to, one or more standard components of a head-end, OTA Receivers: Over The Air Receivers and
30 Satellite receivers and Set-Top Box Controller. A Set-Top Box Controller is

the transmission equivalent of the Headend receiver. This box sends commands from the head-end to the individual user's set-top box. Those commands may include change channel, set decryption key to the following, enable the set-top box to present a pay channel.

- 5 Multiplexor engine **1460** accepts the multiple locally generated channels **1452**, **1454** and **1442** as well as the locally received, and possibly modified, external stream **1444** to create at least one merged stream **1462**. Multiplexor engine **1460** may create more than one merged stream, e.g. **1464**.

- 10 Transmitter **1424** receives at least one merged stream **1462** from multiplexor engine **1460** to generate at least one downlink stream **132** of physical transport **1200**. Transmitter **1424** may receive more than one merged stream **1464** from multiplexor engine **1460**.

- 15 Figure **26** depicts an augmented Headend **1410** of Figure **21** or an augmented Headend **1414** of Figure **22** or an augmented metropolitan Headend **1410** of Figures **21** or **22**, in accordance with the invention.

Note that there may be one transport **1200**. Transceiver **1420** couples to transport **1200** to provide uplink **1204** and downlink **1202** communications between STB's **1100** of Figure **21**.

- 20 There may be multiple transports **1200** corresponding to wireline circuits servicing combinations of at least one of the interfaces **170**, **174** and **178**, as shown in Figures **1**, **2**, **21** and **22**. Transceiver **1420** couples to transport **1200** to provide uplink **1204** and downlink **1202** communications between STB's **1100** of Figures **21** and **22**. Note that transceiver **1420** may provide multiple uplinks **1204**. Transceiver **1420** may provide multiple downlinks **1202**.

- 25 Transceiver **1420** may include transmitter **1424** providing downlink **1202** communications to wireline physical transport **1200**. Multiple downlinks **1202** may be provided by transmitter **1424**. Alternatively, multiple downlinks **1202** may be provided by more than one transmitter **1424**.

Transceiver **1420** may include receiver **1422** providing uplink **1204** communications from wireline physical transport **1200**. Multiple uplinks **1204** may be provided by receiver **1422**. Alternatively, multiple uplinks **1204** may be provided by more than one receiver **1422**.

- 5 Wireline physical transport **1200** may further include separate uplink physical transport **1204** and downlink physical transport **1202**. Various embodiments of the invention may include multiple uplink physical transports **1204**. Various embodiments of the invention may include multiple downlink physical transports **1202**. There may be a difference in the number of uplink physical transports **1204** and the number of downlink physical transports **1202**.
- 10

Note that there may be a difference in the number of transmitters **1424** and the number of receivers **1422**.

- As earlier, the discussion focuses on a single transmitter **1424** providing as many downlinks **1202** and on a single receiver **1422** providing as many uplinks **1204** as required. This is done strictly to simplify the discussion and is not meant to imply any limitation on the invention.
- 15

- Uplink **1204** communication includes a back channel. This back channel includes multiple identified speech channels from multiple user sites (STBs) **1100**, as shown in Figures **21** and **22**. Receiver **1422** provides **1426** a back channel to speech engine **1430**. Speech engine **1430** performs at least the operations of Figure **10**.
- 20

- Speech engine **1430** further communicatively interacts **1474** with network interface **1470**. Network interface **1470** couples **1472** to other network components. Network coupling **1472** may further include a predominantly input coupling **1406** and a predominantly output coupling **1408**.
- 25

- Network interface **1470** may communicatively interact **1476** with Headend system management and billing **1480**. Headend system management and billing **1480** may include systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend node.
- 30

Headend system management and billing **1480** may further maintain systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend node.

5 Headend system management and billing **1480** may include a cache of systems management and billing data relevant to the elements of the overall network managed or controlled through the Headend node.

Speech engine **1430** may communicatively interact **1482** with system management and billing **1480**. Speech engine **1430** may send **1482** system management and billing **1480** requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech engine **1430** may send **1482** system management and billing **1480** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

15 Speech engine **1430** may receive **1482** from system management and billing **1480** credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech engine **1430** may receive **1482** from system management and billing **1480** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions with network interface **1470**, or other external communications networks.

System management and billing **1480** may further include interfaces to other external communications networks. Such circuitry is not the subject of this invention and is not discussed further herein.

25 Similarly, the mechanism of contract acceptance between system management and billing **1480** and financial engines is not the subject of this invention and is not discussed further herein.

Speech engine **1430** may receive **1438** from content engine **1440** content status information. Content status information may include a list of available

services through the coupled network(s). Content status information may further include a list of services available within the node.

Content status information may include a list of content items cached through the network. Content status information may further include a list of content
5 items cached at the node. Cached content items may include Interactive Program Guide (IPG) listings for some period of time. Cached content items may include one or more video sequences provided through Video On Demand (VOD) or Pay-Per-View services.

Content engine **1440** communicatively interacts **1478** with network interface
10 **1470**. Content engine **1440** may provide at least one locally generated multi-media stream **1442** to Multiplexor engine **1460** as well as at least one multi-media stream **1444** received **1478** through network interface **1470**. Content engine **1440** may modify multi-media stream **1444** received **1478** from network interface **1470** through network input **1406**. Content engine **1440**
15 may stimulate **1478** network interface **1470**, altering network output **1408** from network interface **1470**.

Speech engine **1430** may generate one or more channels of speech response content through coupling **1432** to modulator engine **1450**. Modulator engine **1450** may further provide **1434** status and reliability information to speech
20 engine **1430**. Speech response content channels presented through coupling **1432** may be digital. Speech response content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1432** by speech engine **1430**. The multiplexing mechanism onto channel **1432** may perform time
25 division multiplexing. Modulator engine **1450** may demultiplex multiple multiplexed channels received through coupling **1432**. Modulator engine **1250** may convert one or more channels into modulated channels or modulated collections of channels then presented **1452** and **1454** to multiplexor engine **1460**.

30 Multiplexor engine **1460** accepts the multiple locally generated channels **1452**, **1454** and **1442** as well as the locally received, and possibly modified,

external stream **1444** to create at least one merged stream **1462**. Multiplexor engine **1460** may create more than one merged stream, e.g. **1464**.

Transmitter **1424** receives at least one merged stream **1462** from multiplexor engine **1460** to generate at least one downlink stream **1202** of physical transport **1200**. Transmitter **1424** may receive more than one merged stream **1464** from multiplexor engine **1460**.

Figure **27** depicts an alternative augmented Headend **1410** of Figure **21** or an alternative augmented Headend **1414** of Figure **22** or an alternative augmented metropolitan Headend **1410** of Figures **21** or **22**, in accordance with the invention.

Receiver **1422** provides a back channel to speech engine **1430** through interactions **1428** with switch **1490** delivering **1492** the back channel to speech engine **1430**.

Speech engine **1430** communicatively interacts **1474** with network interface **1470** by the speech engine **1430** interacting **1492** with switch **1490** which interacts **1498** with network interface **1470**.

Network interface **1470** may communicatively interact with Headend system management and billing **1480** by communicatively interacting **1498** with switch **1490**, which communicatively interacts **1496** with system management and billing **1480**.

Speech engine **1430** may communicatively interact **1482** with system management and billing **1480** by communicatively interacting **1492** with switch **1490**, which communicatively interacts with system management and billing **1480**.

Speech engine **1430** may receive content status information from content engine **1440** by content engine **1440** interacting **1494** with switch **1490**, which delivers **1492** the content status information to speech engine **1430**.

Content engine **1440** communicatively interacts with network interface **1470** by content engine **1440** communicatively interacting with switch **1490** and network interface **1470** communicatively interacting with switch **1490**.

Switch **1490** may support digital interfaces. Switch **1490** may include a circuit
5 switch. The circuit switch may support Ethernet protocols. Switch **1490** may include an ATM switch. Switch **1490** may support analog interfaces. Such analog interfaces may include wavelength division multiplexing. Switch **1490** may be composed of more than one switch.

The invention may include various combinations of direct interconnections
10 and switch networks as shown in Figures **23** and **24**.

Note that a single computer may perform the operations of the speech engine as shown in Figure **10**. The computer performs these operations as controlled by a program system including program steps residing in accessibly coupled memory.

15 Figure **28A** depicts a block diagram of a speech engine **1330** as shown in Figure **23**.

Receiver **1322** provides **1326** a back channel to speech processor computer **1520**. Speech processor computer **1520** further communicatively interacts **1374** with network interface **1370**.

20 Speech processor computer **1520** may communicatively interact **1382** with system management and billing **1380**. Speech processor computer **1520** may send **1382** system management and billing **1380** requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech
25 processor computer **1520** may send **1382** system management and billing **1380** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech processor computer **1520** may receive **1382** from system management and billing **1380** credit information, authorization profiles for

channel viewing, credit limits and parental safeguards. Speech processor computer **1520** may receive **1382** from system management and billing **1380** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions with network interface **1370** or other external communications networks **1312**.

Speech processor computer **1520** may receive **1338** from content engine **1340** content status information. Content status information may include a list of available services through the coupled network(s). Content status information may further include a list of services available within the node.

Speech processor computer **1520** may generate one or more channels of speech response content through coupling **1332** to modulator engine **1350**. Modulator engine **1350** may further provide **1334** status and reliability information to speech processor computer **1520**. Speech response content channels presented through coupling **1332** may be digital. Speech response content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1332** by speech processor computer **1520**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing. Modulator engine **1350** may demultiplex multiple multiplexed channels received through coupling **1332**. Modulator engine **1250** may convert one or more demultiplexed channels into modulated channels or modulated collections of channels then presented **1352** and **1354** to multiplexor engine **1360**.

Speech processor computer **1520** may further interact **1312** with an external network. Such an interaction may involve at least one wireline physical transport layer. The wireline physical layer may support at least one or a combination of communication protocols using optical, infra-red and radio frequency regions of the electromagnetic spectrum. Network interactions **1312** may support message passing protocols, including, but not limited to,

TCP-IP. Network interactions **1312** may further support communications with the Internet and World Wide Web.

Speech processor computer **1520** communicatively couples with mass storage **1540**. Mass storage **1540** may include, but is not limited to, a disk, disk farm, or RAID. Mass storage **1540** may be organized by a file management system, or by one or more database management systems, or by a combination of file management and at least one database management system.

Figure **28B** depicts a block diagram of a speech engine **1330** as shown in Figure **24**.

Receiver **1322** provides a back channel to speech processor computer **1520** through interactions **1328** with switch **1390** delivering **1392** the back channel to speech engine **1520**.

Speech processor computer **1520** communicatively interacts **1374** with network interface **1370** by the speech processor computer **1520** interacting **1392** with switch **1390** which interacts **1398** with network interface **1370**.

Speech processor computer **1520** may communicatively interact **1382** with system management and billing **1380** by communicatively interacting **1392** with switch **1390**, which communicatively interacts with system management and billing **1380**.

Speech processor computer **1520** may receive content status information from content engine **1340** by content engine **1340** interacting **1394** with switch **1390**, which delivers **1392** the content status information to speech processor computer **1520**.

As in Figure **24**, switch **1390** may support digital interfaces. Switch **1390** may include a circuit switch. The circuit switch may support Ethernet protocols. Switch **1390** may include an ATM switch. Switch **1390** may support analog interfaces. Such analog interfaces may include wavelength division multiplexing. Switch **1390** may be composed of more than one switch.

The operational discussions found in Figures 3, 4, 5 and 28A are directly applicable to systems implementing the invention and resembling the block diagram of Figure 28B. They will not be presented regarding Figure 28B. This is done simply to clarify the disclosure and is not intended in any way to limit the scope of the claims.

The invention may include various combinations of direct interconnections and switch networks as shown in Figures 23 and 24.

Figure 29 depicts a more detailed block diagram of a speech engine 1330 containing gateway 3100 and tightly coupled server array 3200 as shown in Figure 28A.

Server array 3200 includes at least speech processor computer 1520 communicatively coupled with at least speech gateway 3100.

Receiver 1322 provides 1326 a back channel to speech processor computer 1520 via speech gateway 3100. Speech gateway 3100 may further cache speech utterances from various user sites for speech processor computer 1520.

Speech processor computer 1520 further communicatively interact 1374 with network interface 1370 via speech network gateway 1582.

Speech processor computer 1520 may communicatively interact 1382 with system management and billing 1380 via secure interface 1578. Speech processor computer 1520 may send 1382 via secure interface 1578 requests for user account information, including, but not limited to, credit information, authorization profiles for channel viewing, credit limits and parental safeguards. Speech processor computer 1520 may send 1382 via secure interface 1578 user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech processor computer 1520 may receive 1382 via secure interface 1578 credit information, authorization profiles for channel viewing, credit limits

and parental safeguards. Speech processor computer **1520** may receive **1382** via secure interface **1578** confirmation of acceptance of contracts from financial engines. Acceptance of contracts from external financial engines may be received in a number of different ways, including through interactions
5 with network interface **1370** or other external communications networks **1312**.

Speech processor computer **1520** may receive **1338** from content engine **1340** content status information. Content status information may include a list of available services through the coupled network(s). Content status information may further include a list of services available within the node.

10 Speech processor computer **1520** may generate one or more channels of speech response content through coupling **1332** to modulator engine **1350**. Modulator engine **1350** may further provide **1334** status and reliability information to speech processor computer **1520**. Speech response content channels presented through coupling **1332** may be digital. Speech response
15 content channels may be presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed onto coupling **1332** by speech processor computer **1520**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing.

20 Speech processor computer **1520** may further interact **1312** with an external network. Such an interaction may involve at least one wireline physical transport layer, each using at least one of optical, infra-red and radio frequency regions of the electromagnetic spectrum. Network interactions **1312** may support message passing protocols, including, but not limited to,
25 TCP-IP and may further support communications with the Internet and World Wide Web.

Figure **30** depicts an alternative detailed block diagram of a speech engine **1330** as shown in Figure **28A**.

Speech engine **1330** includes server array **3200**. Server array **3200** includes
30 at least speech processor computer **1580** and speech processor computer

1590. At least one of speech processor computer **1580** and speech processor computer **1590** communicatively couples with speech gateway **3100**.

Receiver **1322** provides **1326** a back channel to server array **3200** via speech content gateway **3100**. Speech content gateway **3100** may further cache
5 speech utterances from various user sites for server array **3200**.

Speech content gateway **3100** may further include a computer accessibly coupled **3102** with memory **3104**. Speech content gateway **3100** may be controlled by a program system containing program steps residing in memory **3104** for at least one of the operations of Figure 10.

10 Speech processor computer **1580** and/or **1590** may communicatively interact **1382** with system management and billing **1380** via secure interface **1578**. Speech processor computer **1580** and/or **1590** may send **1382** via secure interface **1578** requests for user account information, including, but not limited to, requests for credit information, authorization profiles for channel viewing,
15 credit limits and parental safeguards. Speech processor computer **1580** and/or **1590** may send **1382** via secure interface **1578** user passwords, confirmation of commitments, commands regarding authorization levels of other users, such as children within a user's household.

Speech processor computer **1580** and/or **1590** within server array **3200** may
20 receive **1382** via secure interface **1578** credit information, authorization profiles for channel viewing, credit limits, parental safeguards as well as confirmation of acceptance of contracts from financial engines.

Acceptance of contracts from external financial engines may be received in a number of different ways, including speech processor computer **1580** and/or
25 **1590** interacting through network gateway **1560** with network interface **1374** and/or other external communications networks **1312**.

Either speech processor computer **1580** or **1590** within server array **3200** may receive **1338** from content engine **1340** content status information.

Either speech processor computer **1580** or **1590** within server array **3200** may generate one or more channels of speech response content through modulator interface **1570** coupling **1332** to modulator engine **1350**. Modulator engine **1350** may provide **1334** status and reliability information through
5 modulator interface **1570** to at least one of speech processor computer **1580** and **1590** within server array **3200**. Speech response content channels presented through modulator interface **1570** to coupling **1332** may be digital, presented as bits or clusters of bits of a specific bit width.

Multiple channels may be multiplexed through modulator interface **1570** onto
10 coupling **1332** by server array **3200**. The multiplexing mechanism onto channel **1332** may perform time division multiplexing. The multiplexing mechanism may be performed by modulator interface **1570**.

At least one speech processor computer **1580** and **1590** within server array **3200** may communicatively interact **1374** with network interface **1370** via
15 network gateway **1560**.

At least one speech processor computer **1580** and **1590** within server array **3200** may interact **1312** with an external network involving at least one wireline physical transport layer. The wireline physical layer may support one or a combination of communication protocols using optical, infra-red and radio
20 frequency regions of the electromagnetic spectrum. Network interactions **1312** may support message passing protocols, including but not limited to, TCP-IP, possibly including communications with the Internet and World Wide Web.

Speech processor computer **1580** and/or **1590** communicatively couples with
25 mass storage **1540**. Mass storage **1540** may include, but is not limited to, a disk, disk farm, or RAID organized by a file management system and/or by one or more database management systems.

Speech processor computer **1580** and/or Speech processor computer **1590** may perform at least some of the operations of Figure **10** and be directed by
30 program system **2000** containing program steps residing in memory **1586**

and/or **1596** accessibly coupled **1585** and/or **1595** to the respective speech processor computer.

Speech processor computer **1580** may perform the same operations of Figure **10** as speech processor computer **1590**, possibly processing speech from
5 different user sites.

Speech processor computer **1580** may perform different operations of Figure **10** than speech processor computer **1590**. By way of example, speech processor computer **1580** may perform receiving the back channel **2004** and partitioning the back channel into the multiple received identified ~~voice~~-speech channels **2012**. Speech processor computer **1590** may perform processing
10 the multiple received identified ~~voice~~-speech channels to create multiple identified speech contents **2022** and responding to the multiple identified speech contents **2032**.

Speech engine **1330** may be controlled by a program system **2000**
15 implementing the operations of Figure **10** distributed as program steps residing in at least one of the memories **3104**, **1586** and **1596**. Each of the operations **2004**, **2012**, **2022**, and **2032** may be implemented as program steps residing in memories **3104**, **1586** and **1596**.

By way of example, speech content gateway **3100** receives the back channel
20 **2004**. Speech processor computer **1580** partitions the back channel into the multiple received identified ~~voice~~-speech channels **2012**. Speech processor computer **1590** processes the multiple received identified ~~voice~~-speech channels to create multiple identified speech contents **2022** and responds to the multiple identified speech contents **2032**.

By way of an alternative example, speech content gateway **3100** receives the
25 back channel **2004** and partitions the back channel into the multiple received identified ~~voice~~-speech channels **2012**. Speech processor computers **1580** and **1590** each process the multiple received identified ~~voice~~- channels to create multiple identified speech contents **2022** and respond to the multiple
30 identified speech contents **2032**. Speech processor computers **1580** and **1590** perform these operations upon different identified ~~voice~~-speech channels

based upon allocation decisions performed by speech content gateway **3100**. To process a speech sample by the allocated speech processor computer into speech content, the processor computer must first contain in its local memory a copy of the grammar definition associated with the user site.

- 5 Figure **31** depicts a second alternative detailed block diagram of a speech engine **1430**.

Server array **3200** at least includes speech processor computer networks **1640** and **1650**. At least one computer contained in speech processor computer network **1640** and/or **1650** communicatively couples with speech
10 gateway **3100**.

At least one computer contained in speech processor computer network **1640** and/or **1650** performs at least some of the operations of Figure **10** and may be directed by program system **2000** containing program steps residing in memory accessibly coupled to that computer.

- 15 Speech processor computer network **1640** may perform different operations of Figure **10** than speech processor computer network **1650**. By way of example, speech processor computer network **1640** processes the multiple received identified ~~voice~~-speech channels to create multiple identified speech contents **2022**. Speech processor computer network **1650** responds to the
20 multiple identified speech contents **2032**.

Speech engine **1430** may be controlled by a program system implementing Figure **10**, distributed as program steps residing in memories accessibly coupled to at least one computer in one or more of the following: speech content gateway **3100**, speech processor computer network **1640** and/or
25 speech processor computer network **1650**. Each of the operations **2004**, **2012**, **2022**, and **2032** may be implemented as program steps residing in at least one of these memories.

By way of example, one or more computers in the speech content gateway **3100** receive the back channel **2004** and partition the back channel into the
30 multiple received identified ~~voice~~-speech channels **2012**. Computers in

speech processor computer networks **1640** and/or **1650** process the multiple received identified ~~voice~~-speech channels to create multiple identified speech contents **2022** and respond to the multiple identified speech contents **2032**. Computers in the speech processor computer networks perform these
5 operations upon identified ~~voice~~-speech channels based upon allocation decisions performed by speech content gateway **3100**.

At least one computer in speech processor computer network **1640** and/or **1650** communicatively interacts **1482** with system management and billing **1480** via secure interface **1630**. That computer(s) may send **1382** via secure
10 interface **1630** requests for user account information as well as commands regarding authorization levels of other users, such as children within a user's household. The user account information may include, but is not limited to, credit information, authorization profiles for channel viewing, credit limits, parental safeguards, user passwords, and confirmation of commitments. A
15 computer in speech processor computer network **1640** and/or **1650** may receive **1482** via secure interface **1630** credit information, authorization profiles for channel viewing, credit limits, parental safeguards, as well as confirmation of acceptance of contracts from financial engines.

Acceptance of contracts from external financial engines may be received in a
20 number of different ways, including through at least one computer in speech processor computer network **1640** and/or **1650** interacting through network gateway **1560** with network interface **1474** or with other external communications networks **1412**.

At least one computer in speech processor computer network **1640** and/or
25 **1650** may receive **1438** from content engine **1440** content status information.

At least one computer in speech processor computer network **1640** and/or **1650** generates one or more channels of speech response content through modulator interface **1620** coupling **1432** to modulator engine **1450**. Modulator engine **1450** may provide **1434** status and reliability information through
30 modulator interface **1620** to at least one computer in speech processor computer network **1640** and/or **1650**.

At least one computer in speech processor computer network **1640** and/or **1650** communicatively interact **1474** with network interface **1470** via network gateway **1610**. At least one computer in speech processor computer network **1640** and/or **1650** may interact **1412** with an external network.

- 5 Note that AgileTV™ Voice Processing Unit (AVPU) boxes **3000** may be included in speech engine **1430** and/or in speech processor computer network **1640** and/or **1650**.

Figure **32A** depicts a block diagram of modulator engine **1350** of Figures **23** and **24**, and modulator engine **1450** of Figures **26** and **27**.

- 10 Speech engine **1330** or **1450** generates one or more channels of speech response content through coupling **1332** or **1432** to modulator engine **1350** or **1450**, respectively. For the sake of simplifying the discussion, from the discussion of Figure **32A** focuses on its application in Figures **23** and **24**. This is done strictly to clarify the discussion and is not meant to limit the scope of the claims.
- 15

Modulator engine **1350** may provide **1334** status and reliability information to speech engine **1330**. Speech response content channels presented through coupling **1332** may be digital, presented as bits or clusters of bits.

- Multiple channels are multiplexed onto coupling **1332** by speech engine **1330**.
- 20 The multiplexing mechanism onto channel **1332** may perform time division multiplexing. Modulator engine **1350** demultiplexes the multiple multiplexed channels received through coupling **1332**, converting one or more demultiplexed channels into modulated channels or modulated collections of channels presented **1352** and **1354** to multiplexor engine **1360**.

- 25 Note that the invention may target specific layers of a residential broadband network serving at least cable television needs for a user community. Modulator engine **1350** may satisfy specific requirements for a wireline node serving a Hybrid Fiber/Coaxial HFCOax node. Modulator engine **1450** may satisfy specific requirements for a wireline node serving a Headend or serving
- 30 a metropolitan Headend.

Modulator engine **1350** may include modulator input and control circuit **1700** receiving one or more channels of speech response content through coupling **1332** and possibly providing **1334** status and reliability information to speech engine **1330**.

- 5 Modulator input and control circuit **1700** may perform operations as disclosed in Application no. 09/661,486, entitled N-way Demultiplexor, docket number AGLE0008, filed 14 September, 2000, and incorporated herein by reference.

Modulator input and control circuit **1700** generates at least one channel code stream **1702** provided to modulator circuit **1706**. Modulator circuit **1706** uses
10 the channel code stream **1702** to generate an intermediate frequency channel stream **1712** presented to frequency conversion circuit **1710**.

By way of example, Figure **32A** depicts modulator input and control circuit **1700** generating a second channel code stream **1704** presented to modulator circuit **1706**. Modulator circuit **1706** uses this second provided channel code
15 stream **1704** to generate a corresponding intermediate frequency channel stream **1714** presented to frequency conversion circuit **1710**.

Frequency conversion circuit **1710** receives at least one intermediate frequency channel stream **1712** and generates a frequency channel output stream **1352** presented to multiplexor engine **1360**, as shown in Figures **23**
20 and **24**. Similarly in Figures **26** and **27**, frequency conversion circuit **1710** receives at least one presented intermediate frequency channel stream **1712** and generates a frequency channel output stream **1452** presented to multiplexor engine **1460**.

Frequency conversion circuit **1710** may receive a second presented intermediate frequency channel stream **1714** and generate a second frequency channel output stream **1354** presented to multiplexor engine **1360**,
25 as shown in Figures **23** and **24**. Similarly in Figures **26** and **27**, frequency conversion circuit **1710** may receive a second presented intermediate frequency channel stream **1714** and generate a second frequency channel output stream **1454** presented to multiplexor engine **1460**.
30

Frequency conversion circuit **1710** may provide feedback **1708** to modulator input and control **1700**, which may be part or all of the status and reliability information **1334** provided to speech engine **1330**.

Alternatively feedback **1708** may be status and reliability information **1334**
5 directly provided to speech engine **1330**, rather than through modulator input and control **1700**. This alternative has not been diagramed to simplify the discussion, but is not intended to limit the scope of the claims.

Modulator circuit **1706** generates intermediate frequency channel stream **1712** using provided channel code stream **1702**.

10 Intermediate frequency channel stream **1712** may include presentation of a sinusoidal waveform represented as a digital stream, or as an analog stream. Presented channel code stream **1702** may include phase control information and/or include frequency control information include amplitude control information. The frequency control information may further regard an
15 intermediate frequency carrier.

Control information may be presented in a separate channel stream.

The intermediate frequency channel stream generation mechanism may support coherent detection and use of the intermediate frequency carrier in a downstream user site receiver. The intermediate frequency channel stream
20 generation mechanism may support modulation mechanisms, including at least, Phase Shift Keying (PSK), Frequency Shift Keying (FSK), Amplitude Shift Keying (ASK), Continuous Phase Modulation (CPM), hybrid combinations, Offset Quadrature PSK (OQPSK), Minimum Shift Keying (MSK), Quadrature Amplitude Modulation (QAM), Coded Orthogonal
25 Frequency Division Multiplexing (COFDM) and Vestigial Side Band (VSB), in particular 8 level VSB (8-VSB).

The intermediate frequency channel stream generation mechanism may support noncoherent detection in downstream user site receivers of the intermediate frequency carrier and/or detection mechanisms not requiring a
30 carrier reference. The intermediate frequency channel stream generation

mechanism may support modulation mechanisms, including at least, Differential Phase Shift Keying (DPSK), Frequency Shift Keying (FSK), Amplitude Shift Keying (ASK), and certain hybrid schemes of these mechanisms not requiring a carrier reference.

- 5 Intermediate frequency channel stream **1712** may include presentation of a wavelet function represented as a digital stream or as an analog stream, which may further include dilation control information and/or temporal offset control information and/or amplitude control information.

10 Intermediate frequency channel stream **1712** may include presentations of both sinusoidal and wavelet functions.

The invention may include multiple frequency conversion circuitry instances **1710** and multiple modulator circuitry instances **1706** in modulator engine **1350** with possibly different numbers of instances of frequency conversion circuitry **1710** and of modulator circuitry **1706**.

- 15 The invention may include multiple frequency conversion circuitry instances **1710** and modulator circuitry instances **1706** in modulator engine **1450** with possibly different numbers of instances of frequency conversion circuitry **1710** and of modulator circuitry **1706**.

20 Demultiplexing a 2.5 gigabit per second bit stream leaving the speech engine **1330** or **1430** may be performed by a preprocessor CPU creating two 16 bit streams. The preprocessor CPU may be part or all of a Broadcom BCM 12500 integrated circuit converting the Ethernet links, with approximately three gigabit bits per second, into two 16 bit 150-160 MHz digital streams.

25 Modulator input and control **1700** may include two preprocessor CPUs parsing the dual 16 bit interface streams into 96 channels of data, or alternatively, include this function performed by hardware.

Modulator circuitry **1706** may include multiple modulators and may include multiple instances of multiple channel modulators, which may implement an octal QAM (Quadrature Amplitude Modulator).

Clusters of 8 channels of data may be sent to each Octal QAM for conversion to a intermediate frequency signal presented to an associated multi-channel frequency upconverter **1710** to generate 8 discrete channels sharing the same output frequency. Each channel output is supplied to one or more
5 nodes to the exclusion of other nodes.

One system wide channel may be devoted to the audio-video feedback of the speech recognition system, of which there are 96 instances of that single channel which are then multiplexed into 96 different fiber transmission lines, each with a unique speech recognition related television channel.

10 This is exploited much more efficiently than any known prior art. Because all these frequency up conversions target the same frequency band, the frequency conversion mechanism for multiple channels can share several critical components, such as local reference oscillators, which must otherwise be instantiated for each channel separately.

15 By performing the frequency conversion mechanism upon blocks of channels, an optimization is available in neighborhoods with extensive Internet usage. In such situations, a neighborhood may be allocated a second TV channel for Internet presentation. By reconfiguring one block of frequency converters to that second channel, up to 8 neighborhoods could receive a second television
20 channel.

Configuring these frequency conversion mechanisms as a frequency agile block changes the channel frequency bands of all the channels of the frequency agile block simultaneously.

The cost savings are dramatic. Regarding reliability issues: there are far
25 fewer parts, a simpler design and less heat, all tending to increase reliability.

There may be a hierarchy of multiplexors operating within content engine **1340** or **1440**. System wide channels are multiplexed in the one set of multiplexors within the content engine **1340** or **1440**. Node specific channels may be multiplexed in a second set of multiplexors within the content engine
30 **1340** or **1440**, which may be within a multiplexor engine such as **1460**.

In a cable TV system using a VOD server, 8 to 16 channels per node are often used for delivery of video on demand. These node specific channels are multiplexed in a second set of multiplexors within the content engine **1340** or **1440** and may be further multiplexed in multiplexor engine **1460**.

- 5 Each NTSC television channel has approximately 6 MHz of bandwidth, which through the use of the QAM64 modulators, delivers 27 M bps. The 2.5 Gigabit per second being delivered supports about 4500 Internet users.

Figure **32B** depicts a block diagram of a local oscillator as is known in the art for use as a local oscillator depicted in Figures **33** and **34** as LO1 **1760**, LO1
10 **1860**, LO2 **1770** or LO2 **1870**.

The first Local Oscillator (LO1) **1760** or **1860** may operate at a fixed frequency **1762** in the range from 900 MHz to 1100 MHz. A second Local Oscillator (LO2) **1770** or **1870** may operate **1772** in a variable range from 1 to 2 GHz, depending on the desired output frequency range.

- 15 The Local Oscillators each comprise a voltage controlled oscillator, a frequency synthesizer and a loop filter. The frequency synthesizer requires a frequency reference. The output of the voltage controlled oscillator is amplified to create local oscillator output, which in various instances is labeled **1762**, **1772**, **1862** and **1872**.
- 20 The frequency synthesizers are required to meet the demanding phase noise, frequency stability and frequency settability requirements of a modern digital cable television network. A substantial portion of the circuitry in the typical Upconverter **1710** is dedicated to the synthesizers of the local oscillators **1760**, **1770**, **1860** and **1870**.
- 25 Specific applications in cable television require a common frequency but with multiple RF outputs such as broadcasting node specific video content or data over multiple nodes using a fixed channel frequency the current practice is to rely on individual RF modulators/Upconverters **1710** per node. Using individual modulator/Upconverters consumes a large amount of equipment

rack space which, for many nodes, including most CATV headends, is a rare commodity.

Figure 33 depicts a detail block diagram of frequency conversion circuitry 1710 of Figure 32A.

- 5 A substantial portion of the circuitry in the typical Upconverter is dedicated to the synthesizers of the local oscillators 1860 and 1870.

The invention includes methods implementing a Common Carrier, Multiple Output RF Upconverter 1710, which include at least one of two methods by which to distribute Local Oscillator signals. The distribution methods provide a
10 local oscillator signal from one local oscillator to multiple upconverter sections simultaneously, eliminating the frequency synthesizers and Voltage Controlled Oscillators typically required for each individual upconverter section. Eliminating these frequency synthesizers and local oscillators substantially reduces the board space and component count normally required for these
15 functions.

By providing a distributed LO, only two LO synthesizers and VCO's are required per board where a board might support anywhere from 2 to 12 or more, upconverter sections.

Figure 34 depicts an alternative detail block diagram of frequency conversion
20 circuitry 1710 of Figure 32A.

For the purposes of simplifying the discussion, the two methods of distributing local oscillator signals will be discussed as associated with the first and second local oscillator, respectively. This is done strictly to simplify the discussion and is not meant to limit the scope of the claims. The first
25 distribution mechanism may be used to distribute the second local oscillator signal(s). The second distribution mechanism may be used to distribute the first local oscillator signal(s).

The first mechanism **1764** distributes the local oscillator signal using hybrid splitters **1766** where the RF output of each tap **1724** and **1824** is fed to the respective frequency conversion sections.

5 A second mechanism **1774** distributing local oscillator signals uses a distributive signal splitting scheme comprised of a series of hybrid directional couplers equally spaced along a signal distribution path. The Local Oscillator signal from the tap of each coupler is then fed to the LO input **1744** and **1844** of each upconverter section. At the 950 to 1100 MHz LO frequencies mentioned above, a directional coupler may be implemented using circuit
10 board traces **1776** in specific geometric pattern, eliminating the need for additional physical components.

Both methods require the LO signals from the splitters or the directional couplers undergo amplification immediately after splitting using a common Monolithic Microwave Integrated Circuit (MMIC) and/or may be incorporated
15 into mixers **1720**, **1740**, **1820** and **1840**.

The Local Oscillator signal levels fed to the mixers are adjusted through the use of resistive attenuators to accommodate the LO drive level specified by the mixer manufacturer. For passive type mixers, the LO drive levels range from +13 dBm to +17 dBm. For active mixers such as a Gilbert Cell based
20 devices, the LO drive levels vary widely, according to the configuration of the mixer. Many Gilbert Cell type mixers incorporate a LO amplifier, thereby requiring very low external LO drive levels, typically in the range from -10dBm to +2dBm.

The Common Carrier, Multiple Output type upconverter differs from the
25 conventional CATV upconverter in that typically, conventional Upconverters are set up to output a separate frequency for each upconverter unit. In contrast, The Common Carrier, Multiple Output Upconverter outputs the same frequency for each upconverter unit.

The Intermediate Frequency (IF) inputs **1712** and **1724** to the Common
30 Carrier, Multiple Output Upconverter may be either a 44 MHz or a 43.75 MHz (Center Frequency) Intermediate Frequency. The bandwidth of the IF is

typically 6 MHz for U.S. applications and 7 to 8 MHz for international applications. The 55 MHz Low Pass Filters **1716** and **1816** serve two functions. First, they remove any second or third harmonics generated in the amplifier chain or D/A converter as in the case of QAM modulation in **1706**.
5 Second, they serve as de-glitching filters for applications that use a D/A converter to generate the 44 MHz IF such as a QAM modulator **1706**.

The filtered 44 MHz IF **1718** and **1818** at the output of the 55 MHz filter **1716** and **1816** is fed to the RF input of the First Mixer **1720** and **1820** where it is mixed with the first Local Oscillator **1760**. By way of example, assume the
10 frequency of the First Local Oscillator **1760** is 903 MHz. The output **1722** and **1822** of First Mixer **1720** and **1820** contain an upper and lower sideband around this Local Oscillator frequency. These sidebands, located at 44 MHz above and 44 MHz below the 903 MHz Local Oscillator frequency, are amplified and fed to the 947 MHz bandpass filter BPF1 **1730** and **1830**. The
15 947 MHz bandpass filter **1730** and **1830** passes the 903 + 44 MHz (947 MHz) upper sideband and rejects the 903-44 MHz (859 MHz) lower sideband.

The filtered output **1732** and **1832** from 947 MHz filter **1730** and **1830** is fed into the RF input of second mixer **1740** and **1840** where it is mixed with the Local Oscillator **1770**. The second Local Oscillator **1770** includes a wide
20 bandwidth VCO controlled by a frequency synthesizer. The Second Local Oscillator **1770** may operate from 1.0 GHz to a little over 1.8 GHz with a frequency step size of 250 KHz. Output **1742** and **1842** from the second mixer **1740** and **1840** contains several frequency products, including the upper and lower sidebands.

25 The upper sideband is formed by adding 947 MHz to the frequency of the Second Local Oscillator **1770**. If the frequency of the Second Local Oscillator **1770** is set to 1000 MHz, then the frequency of the upper sideband coming from the Second Mixer **1750** and **1850** is 947 MHz + Frequency of the Second Local Oscillator **1770** (1000 MHz) or 1947 MHz.

30 This sideband, which is unwanted, may be filtered out by the 950 MHz Lowpass filter **1750** and **1850** and is not seen at the RF output **1452** and **1454**

of the frequency conversion circuitry. The frequency of the lower sideband, which is desired, is determined by the frequency of the second LO (1000 MHz) -947 MHz producing an output frequency of 53 MHz, which easily passes through the 950 MHz Lowpass filter.

- 5 If the frequency of the Second Local Oscillator **1770** was increased to 1807 MHz, then the lower sideband from the second mixer **1740** and **1840** would be 860 MHz, still able to pass through the 950 MHz Lowpass output filter **1750** and **1850**. The outputs **1752** and **1852** from the 950 MHz Lowpass filter **1750** and **1850** are amplified in amplifier detector **1760** and **1860** to obtain the
10 desired output level and sent **1452** and **1454** to the output connector. The amplifier detector may further include tapping off a small portion of the output power, using a directional coupler, to facilitate power measurement **1762** and **1862**.

- The Common Carrier, Multiple Output method differs from the conventional
15 upconverter in at least the following ways. In the Common Carrier system, a single first Local Oscillator and second Local Oscillator drive each upconverter section in a multiple upconverter system. This is accomplished by splitting the Local Oscillator signal into as many lines as needed to drive the mixer in each section. After splitting the LO signal N times, the LO power
20 is reduced and requires amplification to bring the level up for the respective mixer. By splitting both first and second Local Oscillator signals in this manner, the number of upconverter sections for a given board size can be increased dramatically.

- Splitting the Local Oscillator can also be achieved using directional couplers.
25 To maintain essentially consistent LO power along the distribution path, the directional coupler method uses couplers with varying tap values. Couplers closest to the VCO's have the highest tap values (Highest tap a attenuation) and the couplers closest to the end have the lowest tap values.

- The operations of the vertical chains of mixers and filters are essentially the
30 same as described in Figure 33.

In the first frequency conversion section of upconverter **1710** of both Figures **33** and **34**, the second Local Oscillator (LO2) **1770** may comprise a wide bandwidth Voltage Controlled Oscillator, providing the frequency setting agility to span the 50 to 860 MHz frequency range mentioned above. Both Local
5 Oscillators **1760** and **1770** may require high stability frequency synthesizers to meet phase noise, frequency stability and frequency settability requirements of a modern digital cable television network, by way of example.

Consider the second frequency conversion section of Figure **34**. Received intermediate frequency channel stream **1714** may be filtered **1816** to present
10 a filtered intermediate frequency signal **1818** to Mixer1 **1820**.

Unlike Figure **33**, there is no first Local Oscillator (LO1) **1860** in the second frequency conversion section typically operates at a fixed frequency **1862** in the range from 900 MHz to 1100 MHz.

Unlike Figure **33**, there is no second Local Oscillator (LO2) **1870** operates
15 **1872** in the range from 1 to 2 GHz, depending on the desired output frequency range.

Substantial circuitry of this Upconverter section is released from supporting the local oscillators **1860** and **1870**, of Figure **33**.

Figure **35** depicts a detailed diagram of speech engine **1330** as shown in
20 Figure **23** or speech engine **1430** as shown in Figure **27** containing two plex communications grids with dual, redundant gateways.

The numbering scheme is consistent with plex.cpp, an appendix to Application No. 09/679,115, entitled "System and Method of a Multi-dimensional Plex Communication Network", docket number AGLE0003, filed
25 14 October, 2000, which is incorporated by reference herein.

ROM and mass storage is coupled to CPU 8.0, which is associated with node 0.0 of the first plex network. CPU 8.0 is reserved for certain control and security activities, such as maintaining the mass storage system and its

interface, as well as initializing the rest of the plex communication grid to which it is coupled. Mass storage may include RAID mass storage systems.

Note that CPU 8.0 is coupled with both CPU1 0.0 and CPU2 0.1. This coupling may be achieved by various mechanisms, including but not limited to, a bridge circuit interface to a bus tightly coupling CPU1 and CPU2,
5 implementing a bus standard such as LDT or PCI.

Similar couplings are shown for the following: CPU 8.1 coupled with CPU1 1.2 and CPU2 1.3. CPU 8.2 coupled with CPU1 2.4 and CPU2 2.5. CPU 8.3 coupled with CPU1 3.6 and CPU2 3.7. CPU 8.4 coupled with CPU1 4.0 and
10 CPU2 4.1. CPU 8.5 coupled with CPU1 5.2 and CPU2 5.3. CPU 8.6 coupled with CPU1 6.4 and CPU2 6.5. CPU 8.7 coupled with CPU1 7.6 and CPU2 7.7.

ROM and mass storage are redundantly coupled to CPU 8.4, associated with the second plex network. This removes the possibility of a failure in the coupling between either the ROM or mass storage causing systemic failure in
15 the speech engine as a whole. Software running on CPU 8.0 and CPU 8.4 may further support fail-over in the event of a failure of either CPU.

CPU 8.0 and 8.4 act as dual, redundant secure interface gateways.

The control processors of the AgileTV™ engines may be treated differently by the message routing algorithms: No messages may be routed through the control processors, CPU 8.0 and 8.4, headed for a different destination. The
20 CPU 8.0 and 8.4 IO lines may support internal management functions within the node of the cable network, specifically management and billing. This is advantageous for security, making it harder for hacker attacks to penetrate to the management and billing communications, since such attacks will not be
25 able to directly communicate with CPU 8.0 and 8.4 or their IO lines.

Alternatively, special classes of communications may route through the control processor with defined protocols. Other types of communications may transit the node to which the control processor belongs, but may not terminate at the control processor. While it is common for large-scale networks to be

partitioned, this partitioning approach is novel, providing very well characterized data paths for both management and billing communications.

It is advantageous that the control processor owns the disk resources, so that sensitive information such as credit card information does not go through less
5 secure components of the plex network. Sensitive information goes directly from the disk resource through the control processor to the billing application.

Security may be heightened by use of at least one encryption standard including the AES algorithm recently proposed by the US government.

Input processors (8.1 and 8.5) perform the following: receiving incoming ~~voice~~
10 speech packets; buffering the received ~~voice-speech~~ packets; detecting last packet of the received packet sequence to create a complete packet-sequence; and translating the received packet sequence to create a complete audio utterance.

The content gateway includes processors 8.1 and/or 8.5. After registering the
15 application with the AgileTV™ engine, static menu content and dynamic content are provided to the AgileTV™ engine. A speech processor within the AgileTV™ engine sends messages to an application server within the content engine through the content gateway, indicating the current user location in the menu structure and the requested user actions. This triggers events in a real-
20 time event driven program operating system executing within the application server.

CPUs 8.1 and 8.5 may also run a job assignment manager. The job assignment manager may further behave much like a finite state machine.

The IO and control CPUs, 8.1 to 8.7, may be seen as separate from the plex
25 array of processors, or as components of specialized plex-nodes within the plex. The invention may include placing control and IO CPUs as a row of processing resources arranged on a diagonal of the array. The array may be square. Boot ROMs, RAID interfaces, additional communication and image processing capabilities may be additionally coupled to one or more of the IO
30 and control CPUs.

A service modem may connect to a line outside the building of a node or head-end. Each installation may have this modem as a final backup communication channel to a remote service center. CPUs 8.0 and 8.4 may also have the dual modems on a telephone line connected to a remote service center.

CPUs 8.1 and 8.5 are input CPUs communicating the head-end receivers, local content servers such as VOD servers and IPG servers.

CPUs 8.2 and 8.6 are Internet interface processors providing firewall capability.

CPUs 8.3 and 8.7 drive the AgileTV™ modulator system **1350** or **1450** as shown in Figures **23**, **24**, **26** and **27**.

External network interfaces **1312** and **1412** may include External OC-48 (2.5 Gigabit) and/or Gigabit Ethernet Internet lines. This is a central linkage to the Internet supporting 100M bit Ethernet or other communications protocol.

AgileTV™ engine **3000**, **1330**, and **1430** may include two planes of processors, connected by tunnels, each processor plane containing a row of processors coupled by the tunnels and positioned about the diagonal of each processor plane. A diagonal as used herein refers to a collection of locations within an array of at least two dimensions which collective contain nodes coupled to every pencil in every orthogonal pencil ###

Carrier class reliability of 99.999% is the baseline reliability for the plex communications networks. Simulation analyses by one of the inventors confirm that the redundancy inherent in multiple communication pencils intersecting at a plex-node provides significant fault tolerance. These simulations, using the plex.cpp program, indicate that for up to 25 system element failures, there were no message routing failures for 42 out of 43 experiments. The independent power supplies driving dual, plex planes further support these reliability objectives, since if one power supply fails, only half of the system fails. The other half of the system continues to perform, though performance is reduced.

A scaling methodology including another reliability mechanism is desirable. It is achieved at no appreciable increase in the usual systems overhead issues, latency, bandwidth, creating communication bottlenecks or adding significant additional computational loads to the network node components. Another IO processor is added for inter-engine plex-ing to couple multiple plex network hierarchies by the following method: Pick a plex-node, add an inter-processor communication interface internal to the plex-node and an another IO processor coupled to the inter-processor communications interface. The inter-processor communications interface may support a bus, which may be an LDT-compliant bus.

Putting two of these IO processors into the network shown in Figure 35 supports a nother 6 gigabit Ethernet fibers. This supports a 4 by 4 plex of AgileTV™ engines or speech engines. Plex-nodes of this plex network would each contain an AgileTV™ engine or speech engine, containing two planes of 4 by 4 plex networks of plex-nodes each having at least two CPU's. Each CPU may contain at least dual instruction processors.

Such a system supports extremely large computing requirements, such as quantum mechanical modeling of long chain hydro-carbons, or a video server for a population such as a district of a city, e.g. Brooklyn.

The 4 by 4 plex of AgileTV™ speech engines readily fits into an 8 ft (2.6 meter) by 10 ft (3.3 meter) closet by 8 foot (2.6 meter) ceiling. The system is estimated to handle speech recognition for 560,000 cable subscribers with more than 30,000 users talking, with 20-30 gigabits bandwidth exchanged for the user community being served by such cable television systems. The system would exceed the raw compute performance of ASCI White, the world's fastest supercomputer installed at Lawrence Livermore Laboratories in the year 2000.

The AgileTV™ engine provides MPEG throttling techniques enabling support of more users than would otherwise be possible without such intelligent bandwidth management.

The AgileTV™ engine further supports designating a specific subset of plex-nodes, and coupling each plex-node of the subset to at least one additional processor. This provides communication to additional communication pencils connecting to other systems components, which may be additional plex communication networks of processor plex-nodes and may also enhance the security of multiple applications through partitioning.

Communication pencils intersecting at a plex-node provide a hierarchical connection methodology supporting arbitrarily large collections of concurrent computing resources. The communication delay to traverse such a system may grow on the order of the logarithm of the number of computing resource plex-nodes interconnected by these communication pencils.

The methodology using these innovations provides a remarkably large amount of computing resources coupling to almost any communications protocol.

The application of this methodology to cable television networks, with extremely limited upstream communication bandwidth, enables ~~voice~~-speech recognition over cable television, in turn enabling a breakthrough in user friendliness unattainable in the home entertainment environment today.

The further application of this methodology supporting user site addressing and the identification of user ~~voice~~-speech associated with the user site aids the responsiveness of such systems.

An internet browser may execute on a processor in the AgileTV™ engine, decomposing the browser view into pixel frames, which are processed into a MPEG stream, and sent to the frequency up converters, etc.

Consider ~~voice~~-speech actuated interactive game playing. Large motion video sequences may be placed on a game server. The playing of the appropriate motion video sequences may be controlled by ~~voice~~-speech commands using the game server as a local VOD server to the head-end node, communicating through a sufficiently high-speed and responsive communication mechanism, which could be the Internet.

Interactive gambling is supported across cable television networks.

Interactive shopping, based upon shopping content placed on a VOD server and activated through the speech recognition responses of the AgileTV™ engine, is supported.

- 5 Interactive auctioning is supported across cable television networks.

Interactive ~~voice~~-speech communications applications are supported across cable television networks.

The preceding embodiments of the invention have been provided by way of example and are not meant to constrain the scope of the following

- 10 claims.

SYSTEM AND METHOD OF SPEECH RECOGNITION NEAR A WIRELINE NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO DELIVERY

Abstract

5 A method and system of speech recognition presented by a back channel
from multiple user sites within a network supporting cable television and/or
video delivery is disclosed. The preferred embodiment of the invention
comprises ans system and method of using a back channel containing a
multiplicity of identified speech channels from a multiplicity of user sites
10 presented to a speech processing system at a wireline node in a network that
supports at least one of cable television delivery and video delivery. One
embodiment of the invention comprises a method having the steps of
receiving the back channel to create a received back channel; partitioning the
received back channel into a multiplicity of received identified speech
15 channels; processing the multiplicity of received identified speech channels to
create a multiplicity of identified speech content; and responding to the
identified speech content to create an identified speech content response that
is unique, for each of the multiplicity of identified speech contents.

PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 2000

Application or Docket Number

AGLE 0001

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	66	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	66 minus 20 =	46
INDEPENDENT CLAIMS	4 minus 3 =	1
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

SMALL ENTITY TYPE ☐

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RATE	FEE		RATE	FEE
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X\$ 9=	414	OR	X\$18=	
X40=	40	OR	X80=	
+135=	-	OR	+270=	
TOTAL	809	OR	TOTAL	

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CLAIMS AS AMENDED - PART II

4/21/05

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Hide?	Set Name	Query	Hit Count
	<i>DB=PGPB,USPT,EPAB,JPAB,TDBD; PLUR=YES; OP=OR</i>		
☐	L12	L11 and (speech adj content)	4
☐	L11	L10 and link	200
☐	L10	(speaker adj identification) and channel	385
	<i>DB=USPT; PLUR=YES; OP=OR</i>		
☐	L9	5729471.pn.	1
☐	L8	5600775.pn.	1
☐	L7	5596705.pn.	1
☐	L6	5237648.pn.	1
☐	L5	5220657.pn.	1
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☐	L4	(speaker adj identification) and channel and (user adj sites)	11
☐	L3	L1 and (voice or speech)	4
☐	L2	L1 and ((voice or speech) adj recognition)	0
☐	L1	(5450036 5613784 6115605 6306104 6335130 4810225 5508658 5528496 5374899 5589881 6054938 6118600 6160713 6379510 5193945 5291389 5347625 5901773 5930725 4328491 4907017 4956812 5355215 5408884 5557202 5677626 5779516 5619830 3615788 4267992 4325554 4341521 4344243 4376924 4378118 4436777 4477069 4484257 4491319 4495230 4504241 4511416 4556808 4573927 4583006 4614605 4614505 4776097 4839911 4894029).pn.	53

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3475 EDISON WAY, SUITE L
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EXAMINER	
CHAWAN, VIJAY B	
ART UNIT	PAPER NUMBER
2654	
DATE MAILED: 09/07/2005	

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/785,375	02/16/2001	Theodore Calderone	AGLE0001	5055

TITLE OF INVENTION: SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO DELIVERY

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$700	\$300	\$1000	12/07/2005

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.

09/785,375	02/16/2001	Theodore Calderone	AGLE0001	5055

TITLE OF INVENTION: SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO DELIVERY

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE

nonprovisional	YES	\$700	\$300	\$1000	12/07/2005

EXAMINER	ART UNIT	CLASS-SUBCLASS

CHAWAN, VIJAY B	2654	704-270100

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2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are enclosed:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s):

- ☐ A check in the amount of the fee(s) is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above. NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/785,375	02/16/2001	Theodore Calderone	AGLE0001	5055
22862	7590	09/07/2005	EXAMINER	
GLENN PATENT GROUP 3475 EDISON WAY, SUITE L MENLO PARK, CA 94025			CHAWAN, VIJAY B	
			ART UNIT	PAPER NUMBER
			2654	
DATE MAILED: 09/07/2005				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 1078 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 1078 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571) 272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

Notice of Allowability	Application No.	Applicant(s)	
	09/785,375	CALDERONE ET AL	
	Examiner	Art Unit	
	Vijay B. Chawan	2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Applicant's correspondence filed 4/27/2005.
2. ☒ The allowed claim(s) is/are 1-66.
3. ☒ The drawings filed on 2/16/01 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying Indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____ 4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material	5. ☐ Notice of Informal Patent Application (PTO-152) 6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ 7. ☐ Examiner's Amendment/Comment 8. ☒ Examiner's Statement of Reasons for Allowance 9. ☐ Other _____

Vijay B. Chawan

**VIJAY CHAWAN
PRIMARY EXAMINER**

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-66 are allowed.
2. The following is an examiner's statement of reasons for allowance: Applicant teaches a method of using a back channel containing a multiplicity of identified speech channels from a multiplicity of user sites presented to a speech processing system at a wireline node in a network supporting at least one of cable television delivery and video delivery, comprising receiving said back channel to create a received back channel, partitioning said received back channel into a multiplicity of received identified speech channels, processing said multiplicity of said received identified speech channels to create a multiplicity of identified speech channels to create a multiplicity of identified speech content, and responding to said identified speech content to create an identified speech content response that is unique for each of the said multiplicity of identified speech contents. The cited prior art alone or in combination does not teach or fairly suggest the claimed combination of features.

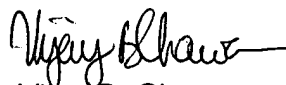
Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Art Unit: 2654

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vijay B. Chawan whose telephone number is (571) 272-7601. The examiner can normally be reached on Monday Through Friday 6:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571) 272-7602. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

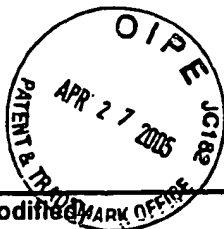
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Vijay B. Chawan
Primary Examiner
Art Unit 2654

vbc
8/8/05

VIJAY CHAWAN
PRIMARY EXAMINER



Form 1449 (Modified) Information Disclosure Statement By Applicant	Atty Docket No. AGLE0001	Serial No.: 09/785,375
	Applicant: Calderone et al.	
	Filing Date: 02/16/2001	Group: 2654

U.S. Patent Application Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
VBC	A	5,446,489	08/29/1995	Egendorf	348	003	01/25/1994
VBC	B	5,774,859	06/30/1998	Houser	704	275	01/03/1995

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-class	Translation	
							Yes	No

Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication

Vijay Chawan

8/5/05

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered.
Include copy of this form with next communication to applicant.

Issue Classification 	Application/Control No.	Applicant(s)/Patent under Reexamination	
	09/785,375	CALDERONE ET AL.	
	Examiner	Art Unit	
	Vijay B. Chawan	2654	

ISSUE CLASSIFICATION											
ORIGINAL					CROSS REFERENCE(S)						
CLASS		SUBCLASS			CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
704		270.1			704	201	231				
INTERNATIONAL CLASSIFICATION					715	719	512	726			
G	1	0	L	21/00	709	217					
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				/							
				/							
(Assistant Examiner) (Date)					 Vijay B. Chawan 8/8/2005 (Part of Primary Examiner) (Date) VIJAY CHAWAN PRIMARY EXAMINER					Total Claims Allowed: 66	
										O.G. Print Claim(s)	O.G. Print Fig.
(Legal Instruments Examiner) (Date)										1	10

☒ Claims renumbered in the same order as presented by applicant										☐ CPA		☐ T.D.		☐ R.1.47	
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		31		61		91		121		151		181		211
	2		32		62		92		122		152		182		212
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	4		34		64		94		124		154		184		214
	5		35		65		95		125		155		185		215
	6		36		66		96		126		156		186		216
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	29		59		89		119		149		179		209		239
	30		60		90		120		150		180		210		240

Index of Claims



Application/Control No.

09/785,375

Examiner

Vijay B. Chawan

Applicant(s)/Patent under Reexamination

CALDERONE ET AL.

Art Unit

2654

√	Rejected
=	Allowed

—	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim		Date						
Final	Original	8/8/05						
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[illegible]

Vijay B. Chawan

2654

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
704	270-279 201, 231, 251	8/8/05	UPC
7	246	8/8/05	UPC
715	719, 912, 93 716, 721, 723 726, 733	8/8/05	UPC
7091 217		8/8/05	UPC

[illegible]

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail

Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
(571) 273-2885

or Fax

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22862 7590 09/07/2005

GLENN PATENT GROUP
3475 EDISON WAY, SUITE L
MENLO PARK, CA 94025

11/18/2005 TBESHAH2 00000056 071445 09785375

01 FC:2501 700.00 DA
02 FC:1504 300.00 DA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Della Revegho (Depositor's name)
(Signature)
17 November 2005 (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/785,375	02/16/2001	Theodore Calderone	AGLE001	5055

TITLE OF INVENTION: SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO DELIVERY

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$700	\$300	\$1000	12/07/2005

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHAWAN, VIJAY B	2654	704-270100

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Michael A. Glenn

2 Glenn Patent Group

3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

AgileTV Corporation

Menlo Park, California

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are enclosed:

- ☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies

4b. Payment of Fee(s):

- ☐ A check in the amount of the fee(s) is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number 07-1445 Glenn Patent Group (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.
NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant, a registered attorney or agent, or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature

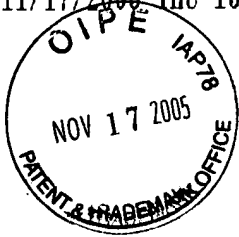
Date 17 November 2005

Typed or printed name Michael A. Glenn

Registration No. 30,176

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Calderone et al.

Docket No.: AGLE0001

Serial No.: 09/785,375

Art Unit: 2654

Filed: 02/16/2001

Examiner: Chawan, Vijay B.

Title: System and Method of Voice Recognition Near a Wireline Node of a Network Supporting Cable Television and/or Video Delivery

Dated: 17 November 2005

Commissioner of Patents
Mail Stop - Issue Fee
P.O. Box 1450
Alexandria, VA 22313-1450

ISSUE FEE AUTHORIZATION

Sir:

Enclosed are the following documents:

1. Certificate of Fax Transmission (1 sheet);
2. Issue Fee Authorization (1 page in duplicate); and
3. Part B Fee Transmittal (1 page in duplicate)

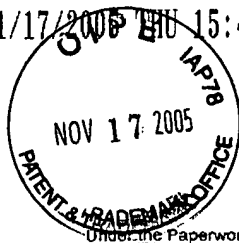
The Commissioner is authorized to charge the Issue Fee of \$ 700.00, Publication Fee of \$300, any additional fees that may be due, and credit any overpayments to Deposit Account No. 07-1445 (Order No. AGLE0001). Enclosed is a copy of this sheet for accounting purposes.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Michael A. Glenn".

Michael A. Glenn
Reg. No. 30,176

Customer No. 22862



PTO/SB/97 (08-03)

Approved for use through 07/31/2008. OMB 0851-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Certificate of Transmission under 37 CFR 1.8**Attorney Docket No. AGLE0001**

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office

From: GLENN PATENT GROUP

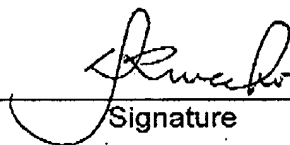
Customer No.: 22,862

Tel: (650) 474-8400

Fax: (650) 474-8401

on 17 November 2005

Date


Signature

Della Revecho

Typed or printed name of person signing Certificate

Note: Each paper must have its own certificate of transmission, or this certificate must identify each submitted paper.

Attached to this cover-sheet please find the following documents:

1. Certificate of Transmission (1 page);
2. Issue Fee Authorization (1 page in duplicate); and
3. Part B Fee Transmittal (1 page in duplicate)

This collection of information is required by 37 CFR 1.8. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.8 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Letters Patent of:
Theodore Calderone et al.

Patent No.: 7,047,196

Issued: May 16, 2006

U.S. Patent Application No. 09/785,375

Title: SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO
DELIVERY

**REQUEST FOR CERTIFICATE OF CORRECTION
PURSUANT TO 37 C.F.R. § 1.323**

Attention: Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

Upon reviewing the above-identified patent, Patentee noted typographical errors which should be corrected.

The errors now sought to be corrected are inadvertent typographical errors, the correction of which does not involve new matter or require reexamination.

Transmitted herewith is a proposed Certificate of Correction effecting such amendment. Patentee respectfully solicits the granting of the requested Certificate of Correction.

Payment in the amount of \$100.00 covering the fee set forth in 37 C.F.R. § 1.20(a) is submitted herewith. The Director is hereby authorized to charge any deficiency in the fees filed or to credit any overpayments to our Deposit Account No. 500665, under Order No. 110707-8001.US01.

Dated: December 15, 2016

Respectfully submitted,

By: /MAG/
Michael A. Glenn
Registration No.: 30,176
PERKINS COIE LLP
P.O. Box 1247
Seattle, Washington 98111-1247
(650) 838-4300
(206) 359-7198 (Fax)
Attorney for Applicant

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 2

PATENT NO. : 7,047,196
APPLICATION NO.: 09/785,375
ISSUE DATE : May 16, 2016
INVENTOR(S) : Theodore Calderone, Paul M. Cook, Mark J. Foster

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 2, Line 22 should be changed from "Headend 10 coupled 106 to Headend 104. These higher" to --Headend 10 coupled 106A to Headend 104. These higher--

Column 2, Lines 24-25 should be changed from "transport of couplings 102, 106 and 108, as well as for 122, 126 and 128." to --transport of couplings 102, 106A and 108, as well as for 122, 126A and 128.--

Column 5, Line 16 should be changed from "located in or near a server farm a web-site hosting facility," to --located in or near a server farm, a web-site hosting facility,--

Column 8, Line 31 should be changed from "set-top box 1120 possessing downlink coupling 1202 and" to --set-top box 1110 possessing downlink coupling 1202 and--

Column 8, Line 38 should be changed from "and receiving initial uplink coupling 1112 from set-top box" to --and receiving initial uplink coupling 1116 from set-top box--

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Column 27, Line 6 should be changed from "1002 with hand held remote 1000 and couplings 1112 and" to --1002 with hand held remote 1000 and couplings 1116 and--

Column 27, Line 10 should be changed from "coupling 1112 from set-top box 1110 as shown in FIG. 19D." to --coupling 1116 from set-top box 1110 as shown in FIG. 19D.--

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 2 of 2

PATENT NO. : 7,047,196

APPLICATION NO.: 09/785,375

ISSUE DATE : May 16, 2006

INVENTOR(S) : Theodore Calderone, Paul M. Cook, Mark J. Foster

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Column 51, Line 21 should be changed from "prised of the step of:" to --prised of the step of:--

Column 51, Line 27 should be changed from "content is further comprised of the step of:" to --content is further comprised of the step of:--

Page 4, Sheet 1 of 35, Fig. 1, reference character "106" between Metropolitan headend 10 and Headend 104 should be --106A--

Page 4, Sheet 1 of 35, Fig. 1, reference character "126" between Headend 104 and Node 124 should be --126A--

Page 6, Sheet 3 of 35, Fig. 3, the text in box 3200 should be changed from "SPEECH RECOGNITION PROCESSOR SYSTEM" to -- SERVER ARRAY--

Page 22, Sheet 19 of 35, Fig. 19D, reference character "1114" should read --1116--

Page 22, Sheet 19 of 35, Fig. 19D, reference character "1116" should read --1114--

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	09785375			
Filing Date:	16-Feb-2001			
Title of Invention:	SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO DELIVERY			
First Named Inventor/Applicant Name:	Theodore Calderone			
Filer:	Michael Glenn/Christine Ortt			
Attorney Docket Number:	AGLE0001			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
CERTIFICATE OF CORRECTION	2811	1	100	100

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				100

Electronic Acknowledgement Receipt

EFS ID:	27813533
Application Number:	09785375
International Application Number:	
Confirmation Number:	5055
Title of Invention:	SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO DELIVERY
First Named Inventor/Applicant Name:	Theodore Calderone
Customer Number:	22862
Filer:	Michael Glenn/Christine Ortt
Filer Authorized By:	Michael Glenn
Attorney Docket Number:	AGLE0001
Receipt Date:	15-DEC-2016
Filing Date:	16-FEB-2001
Time Stamp:	21:35:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 100
RAM confirmation Number	121616INTEFSW21360700
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	110707-8001US01_Request_for_Certificate_of_Correction.pdf	69038	no	2
			e6ca96681530c4404e4d448bca9c7366d6d9bffa7		
Warnings:					
Information:					
2	Request for Certificate of Correction	110707-8001US01_Certificate_of_Correction_page1.pdf	165690	no	2
			3728d3760de752556b990236550e6690f3498c34		
Warnings:					
Information:					
3	Request for Certificate of Correction	110707-8001US01_Certificate_of_Correction_page2.pdf	165268	no	2
			ce71992af8e65b9a5bf1a6dcea7bf76be8d3367e		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30468	no	2
			e8edf39549169911391b59d63d4e939e1d25c499		
Warnings:					
Information:					
Total Files Size (in bytes):			430464		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Letters Patent of:
Theodore Calderone et al.

Patent No.: 7,047,196

Issued: May 16, 2006

U.S. Patent Application No. 09/785,375

Title: SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE
NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO
DELIVERY

**SUBSTITUTE REQUEST FOR CERTIFICATE OF CORRECTION
PURSUANT TO 37 C.F.R. § 1.323**

Attention: Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

Applicant requests the Office review the attached Certificate of Correction forms and disregard the forms submitted on December 15, 2016. Applicant noticed an error in the original requests related to column 51.

Upon reviewing the above-identified patent, Patentee noted typographical errors which should be corrected.

The errors now sought to be corrected are inadvertent typographical errors, the correction of which does not involve new matter or require reexamination.

Transmitted herewith is a proposed Certificate of Correction effecting such amendment. Patentee respectfully solicits the granting of the requested Certificate of Correction.

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Dated: December 22, 2016

Respectfully submitted,

By: /MAG/
Michael A. Glenn
Registration No.: 30,176
PERKINS COIE LLP
P.O. Box 1247
Seattle, Washington 98111-1247
(650) 838-4300
(206) 359-7198 (Fax)
Attorney for Applicant

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 2

PATENT NO. : 7,047,196

APPLICATION NO.: 09/785,375

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INVENTOR(S) : Theodore Calderone, Paul M. Cook, Mark J. Foster

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UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

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APPLICATION NO.: 09/785,375

ISSUE DATE : May 16, 2006

INVENTOR(S) : Theodore Calderone, Paul M. Cook, Mark J. Foster

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	27881733
Application Number:	09785375
International Application Number:	
Confirmation Number:	5055
Title of Invention:	SYSTEM AND METHOD OF VOICE RECOGNITION NEAR A WIRELINE NODE OF A NETWORK SUPPORTING CABLE TELEVISION AND/OR VIDEO DELIVERY
First Named Inventor/Applicant Name:	Theodore Calderone
Customer Number:	22862
Filer:	Michael Glenn/Christine Ortt
Filer Authorized By:	Michael Glenn
Attorney Docket Number:	AGLE0001
Receipt Date:	22-DEC-2016
Filing Date:	16-FEB-2001
Time Stamp:	15:02:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	110707-8001US01_Substitute_Certificate_of_Correction_Requirement.pdf	69088 911d621b51de8b42f468144cfefc5b2068307d5e	no	2

Warnings:

Information:					
2	Request for Certificate of Correction	110707-8001US01_Certificate_of_Correction_page1.pdf	165690	no	2
			3728d3760de752556b990236550e6690f3498c34		
Warnings:					
Information:					
3	Request for Certificate of Correction	110707-8001US01_Certificate_of_Correction_page2_2016-12-22.pdf	165273	no	2
			d10908fe27011022dd8c511e3bbc62c55bcd6191b		
Warnings:					
Information:					
Total Files Size (in bytes):			400051		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been
 filed in the U.S. District Court **Eastern District of Pennsylvania** on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED 12/19/2016	U.S. DISTRICT COURT Eastern District of Pennsylvania
PLAINTIFF Promptu Systems Corporation		DEFENDANT Comcast Corporation and Comcast Cable Communications, LLC
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,260,538	8/21/2007	Promptu Systems Corporation
2 7,047,196	5/16/2006	Promptu Systems Corporation
3 RE44328	6/25/2013	Promptu Systems Corporation
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/785,375	02/16/2001	Theodore Calderone	110707-8001.US01	5055
22862	7590	08/15/2017	EXAMINER	
GLENN PATENT GROUP			CHAWAN, VIJAY B	
c/o Perkins Coie LLP			ART UNIT	
P.O. Box 1247			PAPER NUMBER	
Seattle, WA 98111-1247			2658	
			NOTIFICATION DATE	
			DELIVERY MODE	
			08/15/2017	
			ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Patent No. 7047196
Issued Date: 16 May, 2006
Appl. No: 09/785,375
Filed.: 16 February 2001

PART (A) RESPONSE FOR CERTIFICATES OF CORRECTION

This is a decision on the Certificate of Correction request filed 22 December 2016.

The request for issuance of Certificate of Correction for the above-identified correction(s) under the provisions of 37 CFR 1.322 and/or 1.323 is hereby:

(Check one)

☒ Approved ☐ Approved in Part ☐ Denied

Comments:

PART (B) PETITION UNDER 37 CFR 1.324 OR 37 CFR 1.48

☐ This is a decision on the petition filed to correct inventorship under 37 CFR 1.324.

☐ This is a decision on the request under 37 CFR 1.48, petition filed . In view of the fact that the patent has already issued, the request under 37 CFR 1.48 has been treated as a petition to correct inventorship under 37 CFR 1.324.

The petition is hereby: ☐ Granted ☐ Dismissed

Comment:

The patented filed is being forwarded to Certificate of Corrections Branch for issuance of a certificate naming only the actual inventor or inventors.

/RICHEMOND DORVIL/
Supervisory Patent Examiner, Art Unit 2658
Technology Center 2600
Phone: (571)272-7602

Certificates of Correction Branch email: CustomerServiceCoC@uspto.gov CoC Central Phone Number: (703) 756-1814



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Address: COMMISSIONER FOR PATENTS
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/785,375	02/16/2001	Theodore Calderone	110707-8001.US01	5055
22862	7590	08/17/2017	EXAMINER	
GLENN PATENT GROUP			CHAWAN, VIJAY B	
c/o Perkins Coie LLP			ART UNIT	
P.O. Box 1247			PAPER NUMBER	
Seattle, WA 98111-1247			2658	
			NOTIFICATION DATE	
			DELIVERY MODE	
			08/17/2017	
			ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Patent No. 7047196
Issued Date: 16 May, 2006
Appl. No: 09/785,375
Filed.: 16 February 2001

PART (A) RESPONSE FOR CERTIFICATES OF CORRECTION

This is a decision on the Certificate of Correction request filed 15 December 2016.

The request for issuance of Certificate of Correction for the above-identified correction(s) under the provisions of 37 CFR 1.322 and/or 1.323 is hereby:

(Check one)

☒ Approved ☐ Approved in Part ☐ Denied

Comments:

PART (B) PETITION UNDER 37 CFR 1.324 OR 37 CFR 1.48

☐ This is a decision on the petition filed to correct inventorship under 37 CFR 1.324.

☐ This is a decision on the request under 37 CFR 1.48, petition filed . In view of the fact that the patent has already issued, the request under 37 CFR 1.48 has been treated as a petition to correct inventorship under 37 CFR 1.324.

The petition is hereby: ☐ Granted ☐ Dismissed

Comment:

The patented filed is being forwarded to Certificate of Corrections Branch for issuance of a certificate naming only the actual inventor or inventors.

/RICHEMOND DORVIL/
Supervisory Patent Examiner, Art Unit 2658
Technology Center 2600
Phone: (571)272-7602

Certificates of Correction Branch email: CustomerServiceCoC@uspto.gov CoC Central Phone Number: (703) 756-1814

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,047,196 B2
APPLICATION NO. : 09/785375
DATED : May 16, 2006
INVENTOR(S) : Theodore Calderone et al.

Page 1 of 2

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Drawings

Sheet 1 of 35, Fig. 1, reference character "106" between Metropolitan headend 10 and Headend 104 should be --106A--

Sheet 1 of 35, Fig. 1, reference character "126" between Headend 104 and Node 124 should be --126A--

Sheet 3 of 35, Fig. 3, the text in box 3200 should be changed from "SPEECH RECOGNITION PROCESSOR SYSTEM" to --SERVER ARRAY--

Sheet 19 of 35, Fig. 19D, reference character "1114" should read --1116--

Sheet 19 of 35, Fig. 19D, reference character "1116" should read --1114--

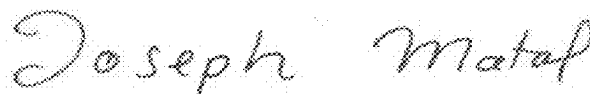
In the Specification

Column 2, Line 22 should be changed from "Headend 10 coupled 106 to Headend 104. These higher" to --Headend 10 coupled 106A to Headend 104. These higher--

Column 2, Lines 24-25 should be changed from "transport of couplings 102, 106 and 108, as well as for 122, 126 and 128." to --transport of couplings 102, 106A and 108, as well as for 122, 126A and 128.--

Column 5, Line 16 should be changed from "located in or near a server farm a web-site hosting facility," to --located in or near a server farm, a web-site hosting facility,--

Signed and Sealed this
Fifth Day of September, 2017



Joseph Matal
*Performing the Functions and Duties of the
Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office*

CERTIFICATE OF CORRECTION (continued)

Page 2 of 2

U.S. Pat. No. 7,047,196 B2

Column 8, Line 31 should be changed from “set-top box 1120 possessing downlink coupling 1202 and” to --set-top box 1110 possessing downlink coupling 1202 and--

Column 8, Line 38 should be changed from “and receiving initial uplink coupling 1112 from set-top box” to --and receiving initial uplink coupling 1116 from set-top box--

Column 8, Line 46 should be changed from “1002 with hand held remote 1000 and couplings 1112 and” to --1002 with hand held remote 1000 and couplings 1116 and--

Column 26, Line 21 should be changed from “box 1110 and receives initial uplink coupling 1112 from” to --box 1110 and receives initial uplink coupling 1116 from--

Column 27, Line 6 should be changed from “1002 with hand held remote 1000 and couplings 1112 and” to --1002 with hand held remote 1000 and couplings 1116 and--

Column 27, Line 10 should be changed from “coupling 1112 from set-top box 1110 as shown in FIG. 19D.” to --coupling 1116 from set-top box 1110 as shown in FIG. 19D.--

In the Claims

Column 51, Line 21 should be changed from “prised the step of:” to --prised of the step of:--

Column 51, Line 27 should be changed from “content is further comprised the step of:” to --content is further comprised of the step of:--