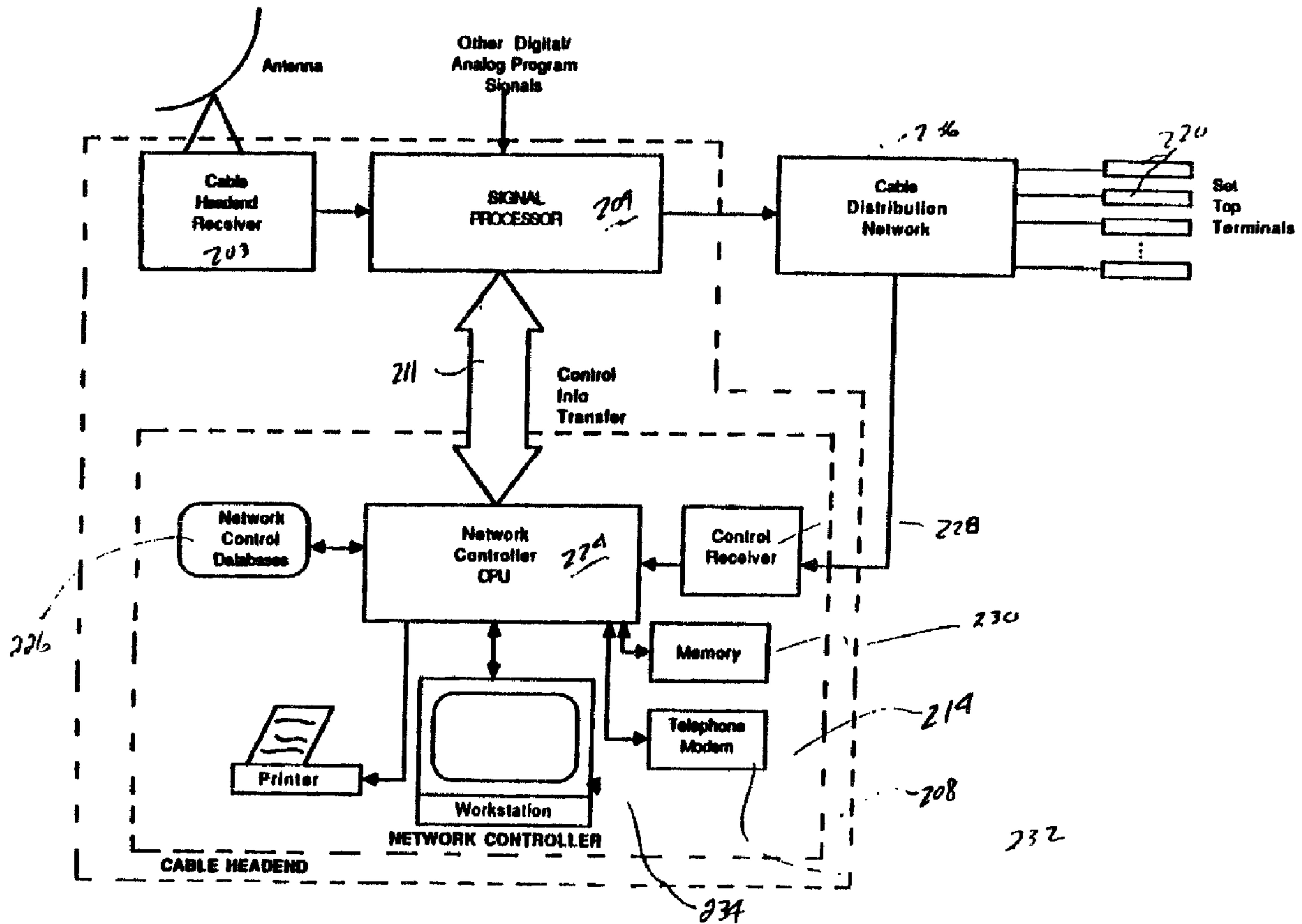




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(54) Titre : CONTROLEUR DE RESEAU POUR SYSTEMES DE TELEVISION CABLES
 (54) Title: NETWORK CONTROLLER FOR CABLE TELEVISION DELIVERY SYSTEMS



(57) Abrégé/Abstract:

A novel network controller for use with a digital cable headend capable of monitoring and controlling set top terminals in a television program delivery system is described. The invention relates to methods and apparatus for a network controller that

(57) Abrégé(suite)/Abstract(continued):

manages a configuration of set top terminals in a program delivery system. The invention is particularly useful in program delivery systems with hundreds of channels of programming, a menu driven program selection system, and a program control information signal that carries data and identifies available program choices. Specifically, the invention modifies a program control information signal at the cable headend before the modified signal is transmitted to each set top terminal. This signal is used with polling methods to receive upstream data from the set top terminals. The invention initiates such upstream data retrieval, gathers all data received and compiles viewer demographics information and programs watched information. The invention processes this data and information to generate packages of advertisements, as well as account and billing reports, targeted towards each set top terminal. The invention uses upstream data reception hardware, databases and processing hardware and software to accomplish these functions.

ABSTRACT

A novel network controller for use with a digital cable headend capable of monitoring and controlling set top terminals in a television program delivery system is described. The invention relates to methods and apparatus for a network controller that manages a configuration of set top terminals in a program delivery system. The invention is particularly useful in program delivery systems with hundreds of channels of programming, a menu driven program selection system, and a program control information signal that carries data and identifies available program choices. Specifically, the invention modifies a program control information signal at the cable headend before the modified signal is transmitted to each set top terminal. This signal is used with polling methods to receive upstream data from the set top terminals. The invention initiates such upstream data retrieval, gathers all data received and compiles viewer demographics information and programs watched information. The invention processes this data and information to generate packages of advertisements, as well as account and billing reports, targeted towards each set top terminal. The invention uses upstream data reception hardware, databases and processing hardware and software to accomplish these functions.

NETWORK CONTROLLER FOR CABLE TELEVISION
DELIVERY SYSTEMS

RELATED APPLICATIONS

5 This application is a divisional of Canadian application serial number 2,151,459 the Canadian National Phase of International patent application PCT/US93/11616 filed 2 December 1993 (02.12.93).

TECHNICAL FIELD

10 The invention relates to television entertainment systems for providing television programming to consumer homes. More particularly, the invention relates to a network controller that monitors, controls and manages a television program delivery network from a cable headend.

15

BACKGROUND OF THE INVENTION

Advances in television entertainment have been primarily driven by breakthroughs in technology. In 1939, advances on Vladmir Zworykin's picture tube provided the
20 stimulus for NBC to begin its first regular broadcasts. In

1975. advances in satellite technology provided consumers with increased programming to homes.

Many of these technology breakthroughs have produced inconvenient systems for consumers. One example is the ubiquitous three remote control home, having a separate and unique remote control for the TV, cable box and VCR. More recently, technology has provided cable users in certain parts of the country with 100 channels of programming. This increased program capacity is beyond the ability of many consumers to use effectively. No method of managing the program choices has been provided to consumers.

Consumers are demanding that future advances in television entertainment, particularly programs and program choices, be presented to the consumer in a user friendly manner. Consumer preferences, instead of technological breakthroughs, will drive the television entertainment market for at least the next 20 years. As computer vendors have experienced a switch from marketing new technology in computer hardware to marketing better useability, interfaces and service, the television entertainment industry will also experience a switch from new technology driving the market to consumer useability driving the market.

Consumers want products incorporating new technology that are useful, and will no longer purchase new technology for the sake of novelty or status. Technological advances in sophisticated hardware are beginning to surpass the capability of the average consumer to use the new technology. Careful engineering must be done to make entertainment products incorporating new technology useful and desired by consumers.

In order for new television entertainment products to be successful, the products must satisfy consumer demands.

TV consumers wish to go from limited viewing choices to a variety of choices, from no control of programming to complete control. Consumers wish to advance from cumbersome and inconvenient television to easy and convenient television and keep costs down. Consumers do not wish to pay for one hundred channels when due to lack of programming information, they seldom, if ever, watch programming on many of these channels. Viewers wish their programming to be customized and targeted to their needs and tastes.

The concepts of interactive television, high definition television and 300 channel cable systems in consumer homes will not sell if they are not packaged, delivered and presented in a useable fashion to consumers. Consumers are already being bombarded with programming options, numerous, "free" cable channels, subscription cable channels and pay-per-view choices. Any further increase in TV entertainment choices, without a user friendly presentation and approach, will likely bewilder viewers with a mind-numbing array of choices.

The TV industry has traditionally marketed and sold its programs to consumers in bulk, such as continuous feed broadcast and long-term subscriptions to movie channels. The TV industry is unable to sell its programming in large quantities on a unit per unit basis, such as the ordering of one program. Consumers prefer a unit sales approach because it keeps costs down and allows the consumer to be more selective in their viewing.

In today's television world, networks manage the program lineup for individual channels. Each network analyzes ratings for television shows and determines the appropriate schedule or program lineup to gain market share

and revenue from advertising. Program ratings are determined using a test group of viewers and statistical analysis methods. Since each channel is in competition with every other channel, there is no coordinated effort to
5 organize television programming in a manner that primarily suits the viewers.

Advertising has become equally annoying, with viewers being "forced" to watch television commercials for goods and services that are neither needed nor desired. As a result,
10 consumers have become impatient and dissatisfied with today's television delivery systems. Equally problematic, these television delivery systems do not have the capabilities, or features necessary to operate in the digital environment. Consequently, advances in digital technology call for a new
15 television program delivery system that is capable of satisfying varying consumer and viewer needs.

Existing cable headends are unequipped for the transition to a digital system. These cable headends have no means for monitoring and controlling the large numbers of
20 program signals and advertisements that will eventually be passed on to both consumers and viewers. These cable headends are unequipped to manage account and billing information for set top terminals without relying on telephone lines. In addition, these cable headends have no
25 means for targeting advertisements to particular consumers and viewers.

What is needed is a network controller for a digital cable headend used in a television delivery system.

What is needed is a versatile network controller for a
30 cable headend.

What is needed is a network controller for use in a cable headend that is capable of operating in both the digital and analog environment.

5 What is needed is certain components of a network controller for a digital cable headend used in a cable television delivery system.

What is needed is a network controller capable of controlling multiple video/audio program signals received by a cable headend from a satellite transponder.

10 What is needed is a network controller that can control the routing of both analog and digital video/audio program signals from cable headend to viewer homes.

15 What is needed is a network controller component for a cable headend that controls the combining the digital video/audio signals.

What is needed is a network controller that creates tiered programming by combining various digital video/audio signals.

20 What is needed is a network controller for a cable headend that accommodates different bandwidth availability between cable headend and certain viewer homes.

What is needed is a network controller capable of modifying program control information received from an external source.

25 What is needed is a network controller capable of targeting video to viewers.

What is needed is a network controller capable of targeting television commercials to specific consumers and viewers.

30 What is needed is a network controller capable of gathering information on programs watched by viewers.

What is needed is a better method of determining program ratings.

What is needed is a network controller capable of managing account and billing information.

5 The present invention is addressed to fulfill these needs.

SUMMARY OF INVENTION

10 The present invention is a network controller for a television delivery system. The network controller is the central component that provides monitoring and control of set top terminals in a television delivery system. The network controller is a key component of a digital cable television delivery system. The network controller of the
15 present invention provides much greater capability and flexibility than existing cable headend control equipment.

The network controller of the preferred embodiment performs all its cable network monitoring and control of set top terminals within the cable headend. The cable headend
20 receives and processes digitally compressed program signals before the signals are relayed to each set top terminal. Each cable headend site is equipped with multiple satellite receiver dishes and a signal processor.

As an intermediary between the set top terminals and
25 the program delivery system's operations center (or other remote site), the cable headend relies on the network controller to perform key cable system operations. In particular, the network controller accommodates regional programming needs by working with other cable headend
30 components. The network controller also performs the system control functions for the cable system.

The primary function of the network controller is to manage the configuration of set top terminals and process signals received from the set top terminals. In the preferred embodiment, the network controller monitors, among other things, automatic poll-back responses from the set top terminals remotely located at each subscribers' home. The polling and automatic report-back cycle occurs frequently enough to allow the network controller to maintain accurate account and billing information as well as monitor authorized channel access.

In the simplest embodiment, information to be sent to the network controller will be stored in RAM within each subscriber's set top terminal and will be retrieved only upon polling by the network controller. Retrieval may, for example, occur on a daily, weekly or monthly basis. The network controller allows the system to maintain complete information on all programs watched using a particular set top terminal.

The network controller is also able to respond to the immediate needs of a set top terminal, or a group of set top terminals. The network controller can modify a program signal received from the program delivery system's operations center before the program signal is transmitted to the set top terminal. Therefore, the network controller enables the delivery system to adapt to the specific requirements of individual set top terminals when information on these requirements cannot be provided to the operations center in advance. In other words, the network controller is able to perform "on the fly programming" changes. With this capability, the network controller can handle sophisticated local programming needs such as interactive television services, split screen video, and

selection of different foreign languages for the same video. In addition, the network controller controls and monitors all compressors and decompressors in the system.

5 The network controller makes use of a number of software routines that assist the network controller to perform its major functions. One of the major routines assists the network controller to modify the program control information so that changes and additions in programming and advertisements can be accommodated. Such changes and
10 additions include set top terminal access authorizations and deauthorizations.

A set top terminal data gathering routine allows the network controller to schedule and perform polling of all set top terminals operating in the system. The software also
15 provides the network controller with a means of processing status reports received from set top terminals in response to polling requests.

A video targeting routine makes use of a viewer's demographic information and viewing habits to determine
20 those advertisements that are of most interest to that particular viewer. In so doing, the routine generates packages of advertisements targeted towards each viewer.

Finally, an additional routine correlates the programs accessed with pricing information to generate billing reports
25 that can be sent to a given set top terminal over the cable distribution network. Aside from this routine, the network

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controller accommodates other methods of billing and account maintenance, such as through the use of remote billing sites.

The present invention is not only able to operate in the digital environment but also introduces many new features to television program delivery and cable headend control.

In one aspect, the present invention provides an apparatus for targeting advertising to at least one subscriber, comprising by: means for gathering programs watched data from a subscriber; and a processor operably connected to the gathering means and including: means for analyzing the gathered programs watched data by determining the frequency of programs watched by the subscriber or the viewing habits of the subscriber; means for correlating the analyzed programs watched data with at least one advertisement by comparing the programs watched data with advertisements; means for selecting at least one correlated advertisement.

In a further aspect, the present invention provides an apparatus for providing digital program signals to subscriber locations, capable of inserting local availability signals and selecting digital program signals received from outside sources, comprising: a means for receiving digital program signals; digital logic circuitry, connected to the receiving means, wherein digital program signals may be inserted and wherein digital programs may be selected; a processor, operably connected to the digital logic circuitry, wherein insertion of local availability signals are controlled and wherein the

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selection of digital program signals are controlled; and means for sending programs, operably connected to the digital logic circuitry, wherein digital program signals are sent to subscriber locations, and wherein digital program signals that have been inserted or selected are sent to subscriber locations.

In a still further aspect, the present invention provides an apparatus for use in a program delivery system having a plurality of program signals, wherein the apparatus receives directions for local insertion from a remote source, comprising: a receiver, wherein directions for local insertion from a remote source are received; a database, containing information on a plurality of programs; a processor, operably connected to the receiver and database, wherein the directions from the remote source are processed to generate a processed signal; a local inserter, connected to the processor, wherein local programming is inserted into a digital program signal using the processed signal from the processor; and a modulator, wherein a plurality of program signals including the program signal carrying the inserted local programming is modulated.

In a further aspect, the present invention provides an apparatus that gathers information related to television viewing habits, comprising: a first processor that provides information related to which television programming was viewed; a first memory coupled to the first processor that stores the information; a second processor that receives the information from the first memory and arranges the

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information as programs watched data; and a second memory coupled to the second processor that stores the programs watched data.

5 In a further aspect, the present invention provides an apparatus that gathers programs watched information from set top terminals in a broadcast television program delivery system, comprising: means for gathering the programs watched information; means for storing the gathered programs watched information; means for sorting the stored programs
10 watched information by a plurality of program categories; and means for ranking the plurality of program categories by frequency of programs watched in each category, wherein program categories with more programs watched are ranked higher than program categories with fewer programs watched.

15 In a still further aspect, the present invention provides a method for gathering programs watched information, comprising: gathering programs watched data for set top terminals in a broadcast television program delivery system; storing the gathered programs watched data in a database;
20 accessing the stored programs watched data; and counting the accessed programs watched data to determine the frequency of programs watched by the set top terminals, wherein programs watched counts are arranged in a programs watched matrix.

25 In a further aspect, the present invention provides a television system that receives and stores data related to television viewing habits at a set top terminal, comprising; a

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receiver operably connected to the set top terminal, the receiver receiving programs watched information from the set top terminal; a processor coupled to the receiver, the processor processing the programs watched information to generate a programs watched matrix; and a database
5 coupled to the processor that stores the programs watched matrix, wherein the processor is capable of intelligent selection of programs to be sent to the set top terminal.

In a further aspect, the present invention provides a network controller for use with digital signal processing equipment in a cable
10 headend capable of remotely monitoring and controlling a plurality of set top terminals in a cable television program delivery system using network control data, each set top terminal receiving a plurality of information fields in a control information stream, the control information stream being produced using a program control information signal received from
15 a remotely located source, the network controller comprising: an interface means, connected to the digital signal processing equipment, for receiving and transferring control information, wherein the program control information signal is received from the digital signal processing equipment on a scheduled basis and the control information stream
20 produced using the program control information signal is transferred to the digital signal processing equipment for distribution over the cable television system; a means for storing the network control data, wherein the stored network control data includes data on television programs; a means for accessing the stored network control data; and a means for
25 generating the control information stream using the received program control information signal and the accessed network control data, wherein the received program information signal carries data on packaged programs or menu content, whereby the information fields of the control information stream are formed by modifying the data on
30 packaged programs or menu content and whereby the control information stream can subsequently be distributed to multiple set top terminals.

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In a still further aspect, the present invention provides a method for using digital signal processing equipment in a cable headend to remotely monitor and control a plurality of set top terminals in a cable television system, each set top terminal adapted to transmit a set top terminal status report and to receive a control information stream produced from a program control information signal that communicates data in an information field, the method comprising the steps of: interfacing with the digital signal processing equipment, wherein the program control information signal is received from the digital signal processing equipment on a scheduled basis and the control information stream produced using the program control information signal is transferred back to the signal processing equipment for distribution over the cable television system; receiving set top terminal status reports, wherein the received set top terminal status reports provide the set top terminals with an upstream data transmission capability; storing network control data, wherein the stored network control data includes data on programs and contents of the received set top terminal status reports; accessing the stored network control data; and generating the control information stream using the received program control information signal and the accessed network control data, wherein the information fields of the control information stream are created and the control information stream is subsequently distributed to multiple set top terminals.

In a still further aspect, the present invention provides a network controller for use with digital signal processing equipment in a cable headend capable of monitoring and controlling a plurality of set top terminals in a cable television program delivery system that uses control information and network control data, wherein entries may be made and viewed by an operator, comprising; an interface, connected to the digital signal processing equipment, wherein the interface receives and transfers control information to the digital signal processing equipment; memory, wherein the memory stores the network control data including data on

television programs in a database format and wherein the stored network control data may be accessed; a network controller CPU, connected to the memory and the interface, for generating a control information stream using the stored network control data from the memory, whereby
5 information fields for the control information stream are formed and the control information stream is subsequently distributed to set top terminals; input device, connected to the network controller CPU, wherein entries may be made; and a display, connected to the network controller CPU, for viewing data and entries made on the input device.

10 In a further aspect, the present invention provides a network controller for remotely managing account and billing information over a cable television distribution network characterized by: a means for creating a polling request message; a means for transmitting the polling request message to set top terminals, wherein the polling request message
15 directs each set top terminal to initiate upstream data transmission of set top terminal status reports over the cable distribution network; a means for receiving the set top terminal status reports, wherein the set top terminal status reports include programs watched data; a means for storing network control data, wherein the stored network control data
20 includes programs watched data and price category data; a means for correlating the programs watched data with the price category data to produce price correlations; and a means for generating at least one billing report based on the produced price correlations; and a means for transmitting the billing reports to the set top terminals for display on a
25 television screen.

In a still further aspect, the present invention provides a network controller for use with a cable headend capable of remotely targeting categories of advertisements to groups of set top terminals in a cable television system, the network controller characterized by: a means for
30 gathering programs watched data for each set top terminal in the cable television system; a means for counting the gathered programs watched data to determine the frequency of programs watched by each set top

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terminal in the cable television program delivery system, wherein the programs watched counts are compiled by program category and time slot; a means for creating set top terminal group information indicating a group assignment for each set top terminal by correlating the programs
5 watched counts with the categories of advertisements, wherein each category advertisements includes one or more advertisements available for targeting to the set top terminals; and a means for transmitting the set top terminal group information to the set top terminal in a control information stream that instructs the set top terminal in selecting targeted
10 advertisements for display during viewing of programs.

In a still further aspect, the present invention provides a network controller for remotely monitoring a plurality of set top terminals in a cable television system, the network controller characterized by: a means for receiving a program control information signal from digital signal
15 processing equipment, wherein the digital signal processing equipment is co-located with the receiving means at the cable headend and the program control information signal is received by the digital signal processing equipment from a remotely located source; a means for storing network control data, wherein the stored network control data includes
20 data on television programs; a means for accessing the stored network control data; a means for generating a control information stream using the received program control information signal and the accessed network control data, wherein the received program information signal carries data on packaged programs or menu content and whereby
25 information fields of the control information stream are created by modifying the data on packaged programs or menu content based on the stored network control data so that the created information fields contain data on modified packages of programs or modified menu content, including program category and menu assignment information; a means
30 for transferring the control information stream to the digital signal processing equipment, whereby the control information stream is subsequently distributed by the digital signal processing equipment to

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multiple set top terminals; a means for gathering programs watched data for each set top terminal in the cable television program delivery system, wherein the gathered programs watched data is stored in the storing means so that it can be accessed by the accessing means; a means for counting the accessed programs watched data to determine the frequency of programs watched by each set top terminal in the cable television program delivery system, wherein the programs watched counts are arranged in at least one programs watched matrix by program category and time slot; and a means, connected to the generating means, for creating set top terminal group information indicating a group assignment for each set top terminal by correlating the programs watched counts with the categories of advertisements, wherein each advertisements category includes advertisements available for targeting to the set top terminals, and wherein the created set top terminal group information is included as data in the control information stream.

In a still further aspect, the present invention provides an apparatus for a program signal delivery system wherein digital program signals are used comprising: a receiver, wherein program signals are received; a demultiplexor, connected to the receiver, wherein program signals are demultiplexed for processing; digital logic, connected to the demultiplexor, wherein demultiplexed signals are processed; a control processing unit, operably connected to the digital logic, wherein the processing of the demultiplexed signals in the digital logic is controlled; multiplexor, connected to the digital logic, wherein processed signals are multiplexed; and a modulator, connected to the multiplexor, wherein multiplexed signals are modulated and wherein the modulated signal is forwarded to subscribers.

In a still further aspect, the present invention provides an apparatus for use with a network having subscribers that uses two-way communications allowing upstream data transmission from the subscriber comprising: a two-way communication system comprising one or more diplex filters, wherein the diplex filters facilitate upstream data

transmissions; a signal processor, operably connected to the two-way communication system, wherein signals are processed before being sent downstream to subscribers; an RF combiner, connected to the two-way communication system, wherein upstream data transmissions are received from the two-way communication system; a network controller, 5 connected to the RF combiner, wherein upstream data transmissions are received from the RF combiner; and wherein program control information is used, and the network controller comprises a processing unit, wherein program control information is processed.

10 In a still further aspect, the present invention provides a computer system for a network which controls video and audio delivery to subscriber locations, comprising: a network connecting subscriber locations; a plurality of terminals, connected to the network, to allow subscribers at subscriber locations to access the network; a processor, 15 connected to the network and remotely located from the subscriber locations, wherein the processor generates control signals to control the distribution of video and audio signals to the plurality of terminals located at subscriber locations; and signal processing equipment, which communicates with the processor through a non-network connection, 20 adapted to output audio and video signals to a plurality of terminals.

In a still further aspect, the present invention provides a network controller for use in a cable system for choosing text overlays, wherein a subscriber may request a text overlay representing the audio associated with the video to a program, wherein a set top terminal transmits the 25 subscriber requests comprising: a means for receiving subscriber requests; a processor to identify the subscriber request for text overlays from a plurality of subscriber requests; a means for choosing the corresponding text overlay from a plurality of text overlays; and a means for transmitting text overlay to the set top terminal for display.

30 In a still further aspect, the present invention provides a system for choosing audio channels, wherein more than one audio channel may exist for a video, comprising: a signal processor, wherein a plurality of digital

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video signals and audio channels are received, and wherein a received video signal may have multiple audio channels; a controller, wherein the controller selects one or more received audio channels, wherein one or more audio channels that correspond to a received video are selected; a
5 distribution system, operably connected to the controller, wherein the selected audio channels are distributed and a listener receives one or more audio channels; and wherein a program control information signal is used by the controller to select one or more received audio channels.

In a still further aspect, the present invention provides an
10 apparatus that gathers programs watched data, comprising: a plurality of terminals connected to corresponding televisions and to a television program delivery system, each of the terminals including a memory that stores program access information; and a receiver coupled to the plurality of terminals, the receiver receiving the program access information,
15 wherein the program access information is stored as programs watched data.

In a still further aspect, the present invention provides a system that gathers programs watched data in a broadcast television delivery system, comprising: means for gathering programs watched data from
20 one or more set top terminals in a broadcast television delivery system; a databases that stores the gathered programs watched data; means for accessing the stored programs watched data; means for counting the accessed programs watched data to determine programs watched counts corresponding to the frequency of programs watched by the one or more
25 set top terminals in the broadcast television delivery system, wherein the programs watched counts are arranged in at least one programs watched matrix; means for creating set top terminal group information indicating a group assignment for a set top terminal by correlating the programs watched counts with categories of videos, wherein the video categories
30 include videos available for sending to the set top terminal; and means for transmitting the set top terminal group information to the set top

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terminal in a control information stream that instructs the set top terminal in selecting the videos for display.

In a further aspect, the present invention provides a method of gathering programs watched information from a set top terminal that
5 acquires programs from a programming source, comprising: receiving a plurality of programs at the set top terminal; selecting a program at the set top terminal from the plurality of programs; monitoring the program selected at the set top terminal; generating programs watched information relating to the selected program; and storing the generated
10 programs watched information.

It is an object of this invention to provide a network controller for a television delivery system.

5 It is an object of this invention to provide a network controller for a digital cable headend used in a cable television delivery system.

It is an object of this invention to provide certain needed components of a network controller for a digital cable headend used in a cable television delivery system.

10 It is an object of this invention to provide a versatile network controller for a cable headend.

It is an object of this invention to provide a network controller for use in a cable headend that is capable of operating in both the digital and analog environment.

15 It is an object of this invention to provide a network controller capable of controlling multiple video/audio program signals received by a cable headend.

20 It is an object of this invention to provide a network controller that can control the routing of both analog and digital video/audio program signals from cable headend to viewer homes.

It is an object of this invention to provide a network controller component for a cable headend that controls the combining the digital video/audio signals.

25 It is an object of this invention to provide a network controller that creates tiered programming by combining various digital video/audio signals.

30 It is an object of this invention to provide a network controller for a cable headend that accommodates different bandwidth availability between cable headend and certain viewer homes.

It is an object of the invention to provide a network controller capable of modifying program control information received from an external source.

5 It is an object of the invention to provide a network controller capable of targeting specific video/audio to specific viewers.

It is an object of the invention to provide a network controller capable of targeting television commercials to specific consumers and viewers.

10 It is an object of the invention to provide a network controller capable of retrieving data gathered at set top terminals.

15 It is an object of this invention to provide a network controller capable of managing account and billing information.

These and other objects and advantages of the invention will become obvious to those skilled in the art upon review of the following description, the attached drawings and appended claims.

20

DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagram of the primary components of the television delivery system.

25 Figure 2 is an overview of the television delivery system operations.

Figure 3 is a schematic of the operation of the primary components of the system.

Figure 4 is a diagram of the primary components of the cable headend.

30 Figure 5 is a diagram of the cable headend showing the primary components of the network controller.

Figure 6a is a schematic of a basic cable headend having network controller components.

Figure 6b is a schematic of an alternative embodiment of Figure 6a.

5 Figure 7 is a detailed diagram of the components of the cable headend.

Figure 8a is a drawing of a broadcast television menu screen to be displayed on a set top terminal.

10 Figure 8b is a drawing of a hit movie menu screen to be displayed on a set top terminal.

Figure 8c is a drawing of a hit movie description menu screen to be displayed on a set top terminal.

Figure 9a is a diagram for out-of-band two-way data transmission for a digital/analog headend.

15 Figure 9b is a diagram for in-band two-way data transmission for a digital/analog headend.

Figure 10a is a diagram of the polling request message format.

20 Figure 10b is a diagram of the polling response message format with an expanded view of the programs accessed block field.

Figure 11 is a diagram of the network controller CPU and its relational components.

25 Figure 12 is diagram of the network control database structure.

Figure 13 is a diagram of the relationship between the major software routines.

Figure 14 is a block diagram of the software flow chart for the Modifying PCI routine.

30 Figure 15 is a block diagram of the software flow chart for the Polling Cycle routine.

Figure 16 is a diagram of a sample programs watched matrix.

Figure 17 is a block diagram of the software flow chart for the Basic Advertisement Targeting routine.

5 Figure 18 is a block diagram of the subroutine flow chart for processing programs watched matrices through correlation algorithms.

Figure 19 is a diagram of the subroutine flow chart for determining final groupings of set top terminals.

10 Figure 20a is a diagram showing a sample assignment of advertising channels to set top terminal groups watching particular categories of programs.

Figure 20b is a diagram assigning available bandwidth for multiple advertising channels.

15 Figure 21 is a diagram of the software flow chart for an alternative to the Basic Advertisement Targeting routine.

Figure 22 is a diagram of the software flow chart for the Account/Billing routine.

20 Figure 23 is a diagram of an embodiment that uses remote statistical and billing sites.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A. Television Program Delivery System Description

1. Introduction

30 Figure 1 shows the present invention as part of an expanded cable television program delivery system 200 that dramatically increases programming capacity using compressed transmission of television program signals. Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media.

The program delivery system 200 shown provides subscribers with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

5 Subscribers are able to access an expanded television program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus. The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access or moving a cursor
10 or highlight bar on the TV screen to access desired programs by simply pressing a single button, rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the press of a single button, the subscriber can advance from one menu to
15 the next. In this fashion, the subscriber can sequence the menus and select a program from any given menu. The programs are grouped by category so that similar program offerings are found on the same menu.

2. Major System Components

20 In its most basic form, the system uses a program delivery system 200 in conjunction with a conventional concatenated cable television system 210. The program delivery system 200 generally includes (i) at least one operations center 202, where program packaging and control
25 information are created and then assembled in the form of digital data, (ii) a digital compression system, where the digital data is compressed, combined/multiplexed, encoded, and mapped into digital signals for satellite transmission to the cable headend 208, and (iii) a set of in-home
30 decompressors. The program delivery system 200 transports the digital signals to the cable headend 208 where the signals are transmitted through a concatenated cable television

system 210. Within the cable headend 208, the received signals may be decoded, demultiplexed, managed by a local central distribution and switching mechanism, combined and then transmitted to the set top terminal 220 located in each subscriber's home over the cable system 210. Although concatenated cable systems 210 are the most prevalent transmission media to the home, telephone lines, cellular networks, fiberoptics, Personal Communication Networks and similar technology for transmitting to the home can be used interchangeably with this program delivery system 200.

The delivery system 200 has a reception region 207 with an in-home decompression capability. This capability is performed by a decompressor housed within a set top terminal 220 in each subscriber's home. The decompressor remains transparent from the subscriber's point of view and allows any of the compressed signals to be demultiplexed and individually extracted from the composite data stream and then individually decompressed upon selection by the subscriber. The decompressed video signals are converted into analog signals for television display. Such analog signals include NTSC formatted signals for use by a standard television. Control signals are likewise extracted and decompressed and then either executed immediately or placed in local storage such as a RAM. Multiple sets of decompression hardware may be used to decompress video and control signals. The set top terminal 220 may then overlay or combine different signals to form the desired display on the subscriber's television. Graphics on video or picture-on-picture are examples of such a display.

Although a single digital compression standard (e.g., MPEG) may be used for both the program delivery system 200 and the concatenated cable system 210, the compression

technique used may differ between the two systems. When the compression standards differ between the two media, the signals received by the cable headend 208 must be decompressed before transmission from the headend 208 to the set top terminals 220. Subsequently, the cable headend 208 must recompress and transmit the signals to the set top terminal 220, which would then decompress the signals using a specific decompression algorithm.

The video signals and program control signals received by the set top terminal 220 correspond to specific television programs and menu selections that each subscriber may access through a subscriber interface. The subscriber interface is a device with buttons located on the set top terminal 220 or on a portable remote control 900. In the preferred system embodiment, the subscriber interface is a combined alpha-character, numeric and iconic remote control device 900, which provides direct or menu-driven program access. The preferred subscriber interface also contains cursor movement and go buttons as well as alpha, numeric and iconic buttons. This subscriber interface and menu arrangement enables the subscriber to sequence through menus by choosing from among several menu options that are displayed on the television screen. In addition, a user may bypass several menu screens and immediately choose a program by selecting the appropriate alpha-character, numeric or iconic combinations on the subscriber interface. In the preferred embodiment, the set top terminal 220 generates the menus that are displayed on the television by creating arrays of particular menu templates, and the set top terminal 220 displays a specific menu or submenu option for each available video signal.

3. Operations Center and Digital Compression System

5 The operations center 202 performs two primary services, packaging television programs and generating the program control information signal. At the operations center 202, television programs are received from external program sources in both analog and digital form. Figure 2 shows an embodiment of the operations center receiving signals from various external sources 212. Examples of the external program sources are sporting events, children's programs, specialty channels, news or any other program source that can provide audio or visual signals. Once the programs are received from the external program sources, the operations center 202 digitizes (and preferably compresses) any program signals received in analog form. The operations center 202 may also maintain an internal storage of programs. The internally stored programs may be in analog or digital form and stored on permanent or volatile memory sources, including magnetic tape or RAM. Subsequent to receiving programming, the operations center 202 packages the programs into the groups and categories which provide the optimal marketing of the programs to subscribers. For example, the operations center 202 may package the same programs into different categories and menus for weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center 202 packages the television programs in a manner that enables both the various menus to easily represent the programs and the subscribers to easily access the programs through the menus.

The packaging of the digital signals is typically performed at the operations center 202 by computer assisted packaging equipment (CAP). The CAP system normally

includes at least one computer monitor, keyboard, mouse, and standard video editing equipment. A programmer packages the signals by entering certain information into the CAP. This information includes the date, time slot, and program category of the various programs. The programmer and the CAP utilize demographic data and ratings in performing the packaging tasks. After the programmer selects the various programs from a pool of available programs and inputs the requisite information, the programmer, with assistance from the CAP, can select the price and allocate transponder space for the various programs. After the process is complete, the CAP displays draft menus or program schedules that correspond to the entries of the programmer. The CAP may also graphically display allocation of transponder space. The programmer may edit the menus and transponder allocation several times until satisfied with the programming schedule. During the editing, the programmer may direct the exact location of any program name on a menu with simple commands to the CAP.

The packaging process also accounts for any groupings by satellite transponder which are necessary. The operations center 202 may send different groups of programs to different cable headends 208 and/or set top terminals 220. One way the operations center 202 may accomplish this task is to send different program packages to each transponder. Each transponder, or set of transponders, then relays a specific program package to specific cable headends 208 and/or set top terminals 220. The allocation of transponder space is an important task performed by the operations center 202.

The operations center 202 may also "insert" directions for filling local available program time in the packaged signal

to enable local cable and television companies to fill the program time with local advertising and/or local programming. Consequently, the local cable headends 208 are not constrained to show only programs transmitted from the operations center 202. New set top converters will incorporate both digital and analog channels. Therefore, the cable headend 208 may combine analog signals with the digital signals prior to transmitting the program signals to the set top terminals 220.

After the CAP packages the programs, it creates a program control information signal to be delivered with the program package to the cable headend 208 and/or set top terminal 220. The program control information signal contains a description of the contents of the program package, commands to be sent to the cable headend 208 and/or set top terminal 220, and other information relevant to the signal transmission.

In addition to packaging the signal, the operations center 202 employs digital compression techniques to increase existing satellite transponder capacity by at least a 4:1 ratio, resulting in a four-fold increase in program delivery capability. A number of digital compression algorithms currently exist which can achieve the resultant increase in capacity and improved signal quality desired for the system. The algorithms generally use one or more of three basic digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within carrier compression. Specifically, in the preferred embodiment, the MPEG 2 compression method is used. After digital compression, the signals are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to various uplink sites 204.

There may be a single uplink site 204 or multiple uplink sites (represented by 204', shown in phantom in Figure 1) for each operation center 202. The uplink sites 204 may either be located in the same geographical place or
5 may be located remotely from the operations center 202. Once the composite signal is transmitted to the uplink sites 204, the signal may be multiplexed with other signals, modulated, upconverted and amplified for transmission over satellite. Multiple cable headends 208 may receive such
10 transmissions.

In addition to multiple uplinks, the delivery system 200 may also contain multiple operations centers. The preferred method for using multiple operations centers is to designate one of the operations centers as a master operations center
15 and to designate the remaining operations centers as slave operations centers. In this configuration, the master operations center coordinates various functions among the slave operations centers such as synchronization of simultaneous transmissions and distributes the operations
20 workload efficiently.

4. Cable Headend

After the operations center 202 has compressed and encoded the program signals and transmitted the signals to the satellite, the cable headend 208 receives and further
25 processes the signals before they are relayed to each set top terminal 220. Each cable headend site is generally equipped with multiple satellite receiver dishes. Each dish is capable of handling multiple transponder signals from a single satellite and sometimes from multiple satellites.

30 As an intermediary between the set top terminals 220 and the operations center 202 (or other remote site), the cable headend 208 performs two primary functions. First,

the cable headend 208 acts as a distribution center, or signal processor, by relaying the program signal to the set top terminal 220 in each subscriber's home. In addition, the cable headend 208 acts as a network controller 214 by receiving information from each set top terminal 220 and passing such information on to an information gathering site such as the operations center 202.

Figure 3 shows an embodiment where the cable headend 208 and the subscriber's home are linked by certain communications media 216. In this particular embodiment, analog signals, digitally compressed signals, other digital signals and up-stream/interactivity signals are sent and received over the media 216. The cable headend 208 provides such signaling capabilities in its dual roles as a signal processor 209 and network controller 214.

As a signal processor 209, the cable headend 208 prepares the program signals that are received by the cable headend 208 for transmission to each set top terminal 220. In the preferred system, the signal processor 209 re-routes or demultiplexes and recombines the signals and digital information received from the operations center 202 and allocates different portions of the signal to different frequency ranges. Cable headends 208 which offer different subscribers different program offerings may allocate the program signals from the operations center 202 in various manners to accommodate different viewers. The signal processor 209 may also incorporate local programming and/or local advertisements into the program signal and forward the revised signal to the set top terminals 220. To accommodate this local programming availability, the signal processor 209 must combine the local signal in digital or analog form with the operations center program signals. If

the local cable system uses a compression standard that is different than the one used by the operations center 202, the signal processor 209 must also decompress and recompress incoming signals so they may be properly formatted for transmission to the set top terminals 220. This process becomes less important as standards develop (i.e., MPEG 2). In addition, the signal processor 209 performs any necessary signal decryption and/or encryption.

As a network controller 214, the cable headend 208 performs the system control functions for the system. The primary function of the network controller 214 is to manage the configuration of the set top terminals 220 and process signals received from the set top terminals 220. In the preferred embodiment, the network controller 214 monitors, among other things, automatic poll-back responses from the set top terminals 220 remotely located at each subscribers' home. The polling and automatic report-back cycle occurs frequently enough to allow the network controller 214 to maintain accurate account and billing information as well as monitor authorized channel access. In the simplest embodiment, information to be sent to the network controller 214 will be stored in RAM within each subscriber's set top terminal 220 and will be retrieved only upon polling by the network controller 214. Retrieval may, for example, occur on a daily, weekly or monthly basis. The network controller 214 allows the system to maintain complete information on all programs watched using a particular set top terminal 220.

The network controller 214 is also able to respond to the immediate needs of a set top terminal 220 by modifying a program control information signal received from the operations center 202. Therefore, the network controller

214 enables the delivery system to adapt to the specific requirements of individual set top terminals 220 when the requirements cannot be provided to the operations center 202 in advance. In other words, the network controller 214 is able to perform "on the fly programming" changes. With this capability, the network controller 214 can handle sophisticated local programming needs such as, for example, interactive television services, split screen video, and selection of different foreign languages for the same video. In addition, the network controller 214 controls and monitors all compressors and decompressors in the system.

The delivery system 200 and digital compression of the preferred embodiment provides a one-way path from the operations center 202 to the cable headend 208. Status and billing information is sent from the set top terminal 220 to the network controller 214 at the cable headend 208 and not directly to the operations center 202. Thus, program monitoring and selection control will take place only at the cable headend 208 by the local cable company and its decentralized network controllers 214 (i.e., decentralized relative to the operations center 202, which is central to the program delivery system 200). The local cable company will in turn be in communication with the operations center 202 or a regional control center (not shown) which accumulates return data from the set top terminal 220 for statistical or billing purposes. In alternative system embodiments, the operations center 202 and the statistical and billing sites are collocated. Further, telephone lines with modems are used to transfer information from the set top terminal 220 to the statistical and billing sites.

5. Set Top Terminal

The set top terminal 220 is the portion of the delivery system 200 that resides in the home of a subscriber. The set top terminal 220 is usually located above or below the subscriber's television, but it may be placed anywhere in or near the subscriber's home as long as it is within the range of the subscriber's remote control device 900. In some aspects, the set top terminal 220 may resemble converter boxes already used by many cable systems. For instance, each set top terminal 220 may include a variety of error detection, decryption, and coding techniques such as anti-taping encoding. However, it will become apparent from the discussion below that the set top terminal 220 is able to perform many functions that an ordinary converter box cannot perform.

The set top terminal 220 has a plurality of input and output ports to enable it to communicate with other local and remote devices. The set top terminal 220 has an input port that receives information from the cable headend 208. In addition, the unit has at least two output ports which provide communications from the set top terminal 220 to a television and a VCR. Certain menu selections may cause the set top terminal 220 to send control signals directly to the VCR to automatically program or operate the VCR. Also, the set top terminal 220 contains a phone jack which can be used for maintenance, trouble shooting, reprogramming and additional customer features. The set top terminal 220 may also contain stereo/audio output terminals and a satellite dish input port.

Functionally, the set top terminal 220 is the last component in the delivery system chain. The set top terminal 220 receives compressed program and control signals from the cable headend 208 (or, in some cases,

directly from the operations center 202). After the set top terminal 220 receives the individually compressed program and control signals, the signals are demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in local storage (from which the menu template may be created), executed immediately, or sent directly to the television screen.

After processing certain signals received from the cable headend 208, the set top terminal 220 is able to store menu templates for creating menus that are displayed on a subscriber's television by using an array of menu templates. Before a menu can be constructed, menu templates must be created and sent to the set top terminal 220 for storage. A microprocessor uses the control signals received from the operations center 202 or cable headend 208 to generate the menu templates for storage. Each menu template may be stored in volatile memory in the set top terminal 220. When the set top terminal receives template information it demultiplexes the program control signals received from the cable headend 208 into four primary parts: video, graphics, program logic and text. Each menu template represents a different portion of a whole menu, such as a menu background, television logo, cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu templates may be deleted or altered using control signals received from the operations center 202 or cable headend 208.

Once the menu templates have been stored in memory, the set top terminal 220 can generate the appropriate menus. In the preferred embodiment, the basic menu format information is stored in memory located within the set top terminal 220 so that the microprocessor may locally access

the information from the set top terminal instead of from an incoming signal. The microprocessor next generates the appropriate menus from the menu templates and the other menu information stored in memory. The set top terminal
5 220 then displays specific menus on the subscriber's television screen that correspond to the inputs the subscriber selects.

If the subscriber selects a specific program from a menu, the set top terminal 220 determines on which channel
10 the program is being shown, demultiplexes and extracts the single channel transmitted from the cable headend 208. The set top terminal 220 then decompresses the channel and, if necessary, converts the program signal to an analog NTSC signal to enable the subscriber to view the selected program.
15 The set top terminal 220 can be equipped to decompress more than one program signal, but this would unnecessarily add to the cost of the unit since a subscriber will generally only view one program at a time. However, two or three decompressors may be desirable to provide picture-on-
20 picture capability, control signal decompression, enhanced channel switching or like features.

In addition to menu information, the set top terminal 220 may also store text transmitted from the cable headend 208 or the operations center 202. The text may inform the
25 subscriber about upcoming events, billing and account status, new subscriptions, or other relevant information. The text will be stored in an appropriate memory location depending on the frequency and the duration of the use of the textual message.

30 Also, optional upgrades are available to enhance the performance of a subscriber's set top terminal 220. These upgrades may consist of a cartridge or computer card (not

shown) that is inserted into an expansion slot in the set top terminal 220 or may consist of a feature offered by the cable headend 208 or operations center 202 to which the user may subscribe. Available upgrades may include on line data base services, interactive multi-media services, access to digital radio channels, and other services.

In the simplest embodiment, available converter boxes such as those manufactured by General Instruments or Scientific Atlanta, may be modified and upgraded to perform the functions of a set top terminal 220. The preferred upgrade is a circuit card with a microprocessor which is electronically connected to or inserted into the converter box.

6. Remote Control Device

The primary conduit for communication between the subscriber and the set top terminal 220 is through the subscriber interface, preferably a remote control device 900. Through this interface, the subscriber may select desired programming through the system's menu-driven scheme or by directly accessing a specific channel by entering the actual channel number. Using the interface, the subscriber can navigate through a series of informative program selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can access desired programs by simply pressing a single button rather than recalling from memory and pressing the actual channel number to make a selection. The subscriber can access regular broadcast and basic cable television stations by using either the numeric keys on the remote control 900 (pressing the corresponding channel number), or one of the menu icon selection options.

In addition to enabling the subscriber to easily interact with the cable system 200, the physical characteristics of the

subscriber interface 900 should also add to the user friendliness of the system. The remote control 900 should easily fit in the palm of the user's hand. The buttons of the preferred remote control 900 contain pictorial symbols that are easily identifiable by the subscriber. Also, buttons that perform similar functions may be color coordinated and consist of distinguishing textures to increase the user friendliness of the system.

7. Menu-Driven Program Selection

The menu-driven scheme provides the subscriber with one-step access to all major menus, ranging from hit movies to sport specials to specialty programs. From any of the major menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-character access.

There are two different types of menus utilized by the preferred embodiment, the Program Selection menus and the During Program menus. The first series of menus, Program Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The second series of menus, During Program menus, consists of two primary types, Hidden menus and the Program Overlay menus.

Immediately after the subscriber turns on the set top terminal 220, the Introductory menu welcomes the subscriber to the system. The Introductory menu may display important announcements from the local cable franchise, advertisements from the cable provider, or other types of messages. In addition, the Introductory menu can inform the subscriber if the cable headend 208 has sent a personal message to the subscriber's particular set top terminal 220.

After the Introductory menu has been displayed the subscriber may advance to the next level of menus, namely the Home menu. In the preferred embodiment, after a

certain period of time, the cable system will advance the subscriber by default to the Home menu. From the Home menu, the subscriber is able to access all of the programming options. The subscriber may either select a program directly
5 by entering the appropriate channel number from the remote control 900, or the subscriber may sequence through incremental levels of menu options starting from the Home menu. The Home menu lists categories that correspond to the first level of menus called Major menus.

10 If the subscriber chooses to sequence through subsequent menus, the subscriber will be forwarded to the Major menu that corresponds to the chosen category from the Home menu. The Major menus further refine a subscriber's search and help guide the subscriber to the
15 selection of his choice.

From the Major menus, the subscriber may access several submenus. From each submenu, the subscriber may access other submenus until the subscriber finds a desired television program. Similar to the Major menu, each
20 successive level of Submenus further refines the subscriber's search. The system also enables the subscriber to skip certain menus or submenus and directly access a specific menu or television program by entering the appropriate commands on the remote control 900.

25 The During program menus (including Hidden Menus and Program Overlay Menus) are displayed by the set top terminal 220 only after the subscriber has selected a television program. In order to avoid disturbing the subscriber, the set top terminal 220 does not display the
30 Hidden Menu until the subscriber selects the appropriate option to display a Hidden Menu. The Hidden Menus contain options that are relevant to the program selected by the

viewer. For example, a Hidden Menu may contain options that enable a subscriber to enter an interactive mode or escape from the selected program.

5 Program Overlay Menus are similar to Hidden Menus because they occur during a program and are related to the program being viewed. However, the Program Overlay Menus are displayed concurrently with the program selected by the subscriber. Most Program Overlay Menus are small enough on the screen to allow the subscriber to continue viewing the
10 selected program comfortably.

B. Network Controller Description

1. Monitoring and Control of Set Top Terminals

15 Figure 4 shows the network controller 214 of the present invention as part of a digital cable headend 208 operating in an expanded cable television program delivery system, indicated generally at 200. The network controller 214 monitors program selections at subscribers' homes,
20 maintains accurate account and billing information and authorizes both subscriber channel access and particular set top terminals 220 to operate in the system.

The network controller 214 performs its monitoring and control capability by working with other system
25 components housed, in part, within the cable headend 208. These cable headend components include a cable headend receiver 203 and a signal processor 209. As shown in the Figure 4, digital RF program signals 205 are received and processed for further distribution to a subscriber's home
30 through a set top terminal 220. The program signals 205 are digitally compressed and multiplexed signals that may be processed at the cable headend 208 or simply passed through to the cable distribution network. In the embodiment shown

in Figure 4, the program signals 205 are received by the cable headend receiver 203 and transmitted to the signal processor 209.

5 The signal processor 209 prepares the program signals 205 that are received by the cable headend 208 for transmission to each set top terminal 220. In the preferred system, the network controller 214 supervises and, in some cases, instructs the signal processor 209 in routing the signals to subscribers. In this way, the network controller 10 214 and signal processor 209 work with one another to perform basic control functions in the cable television system 200. Typically, this work is accomplished by the transfer of control information, represented at 211, between the network controller 214 and the signal processor 209.

15 Although it is preferred that the signal processor 209 and network controller 214 be co-located at the cable headend 208, the network controller 214 may be remotely located from the cable headend 208, as long as it remains in communication with the signal processor 209 in order to 20 exchange control information 211.

In many instances, the program signals 205 received from the operations center 202 must be modified prior to being sent to the set top terminals 220. These modifications to the program control information 211 are made by the 25 network controller 214 working in conjunction with the signal processor 209 to send a set top terminal control information stream (STTCIS). From the signal processor 209, the network controller 214 receives the program signals 205, which include cable franchise specific information added by the operations center 202. The 30 network controller 214 modifies the program signals 205, if necessary, and communicates the new information back to

the signal processor 209. The signal processor 209 then forwards the information to the set top terminal 220 in the form of the STTCIS, arrow 215. In most instances, the network controller 214 will modify the program signals 205 by adding additional information; however, the program signals 205 can be passed through the cable headend 208 to the set top terminal 220 without any modification.

The signal processor 209 and network controller 214 are both capable of handling the addition of simple local availabilities (e.g., local advertisements) into the signal sent to the set top terminal 220. The network controller 214 is also capable of handling more sophisticated local programming needs such as targeting video commercials, infomercials, interactive programming and certain data services. The network controller 214 receives all electronic signals sent by the set top terminal 220, including those sent in response to interactive service requests and some data service requests. The network controller 214 coordinates the necessary switching and access to allow the subscriber to enjoy these services.

The network controller 214 has the capability of performing "on the fly programming" changes, assisting in (i) masking portions of subscriber's television screens (split screen video), (ii) selecting different audio signals for the same video (foreign languages), and (iii) interactive features. In addition, the network controller can create programming changes. For last minute changes to programming (such as for a local emergency or important regional events), an operator using the network controller 214 can modify the program signals 209 "on the fly" and change menus available to the subscriber. This accommodates short notice changes

to program packaging that cannot be handled by the operations center 202 in advance.

In order to accommodate split screen techniques for promo and demo video (which will be described later),
5 undesired video portions of the television or menu screen may be masked. The network controller 214 can send the necessary control information to inform the set top terminal 220 to mask portions of a specific channel's video. For example, a video channel with a split screen showing four
10 separate videos would require a three-fourths mask to focus the viewer on the featured video clip.

Tiered programming allows different users to view different video even though they are "tuned" to the same channel. For example, the network controller 214 may know
15 the demographics of its subscribers through a database generated, in part, from prior subscriber choices, an interactive selection, or other means. Using the demographics information, the network controller 214 may target commercials to the correct audience by showing
20 different commercials to subscriber's with different demographics. Information on programs watched may also be used to target commercials. Even though subscribers will believe they are "tuned" to one channel, they will be switched to a different channel for the tiered video and
25 targeted commercial. Alternatively, individual subscribers may be offered a menu with the option of several commercials from which to choose.

To accommodate foreign speaking subscribers, multiple audio channels for television programming may be provided.
30 The subscriber may be shown menus of programs available in the subscriber's native language. The function of choosing the correct audio to correspond to the selected language may

be handled by either the set top terminal 220 or the network controller 214 depending upon the configuration. Local programming in several languages or additional audio channels for a foreign language translation of a popular television program may be provided by the network controller 214. Using a picture-on-picture feature, sign language may be similarly made available to certain set top terminals 220 for the deaf. The sign language video may be transmitted to the set top terminal 220 on a separate channel. Also, a text overlay for the deaf may be easily produced on the lower part of the screen. The control signals for producing the text overlay may be handled by the network controller 214.

In other embodiments, the network controller 214 can act as a central computer and provide intra-set top terminal interactive games, inter-set top terminal interactive games, computer bulletin board type services, message services (Electronic mail), etc. For example, a subscriber may play war games with six of his (anonymous) fellow subscribers each in their own home each operating a separate tank. The network controller 214 gathers the players using set top terminal 220 communications and acts as the referee. The network controller software "plays" the game and generates the video control signals to be transmitted to the set top terminals 220. From the video control signals, the set top terminal generates a view of the playing field and shows movement of the tanks. Using a similar method, a bulletin board or message system can be set up to discuss a particular program such as "Twin Peaks Whodunit" for enthusiasts with set top terminals 220.

2. Monitoring and Control of Cable Headend Signal Processor

Figure 5 shows the network controller's major components and how these components relate with other components of the cable system 200. The network controller's internal components include a network controller CPU 224, databases 226, control receiver 228, local memory 230 and telephone modem 232. The network controller's CPU 224 and databases 226 may be accessed through an operator control station, which may include peripherals such as a computer workstation, CRT display, and printer, represented by the workstation 234.

Information required to operate the network controller 214 will be stored in databases 226 and local memory 230 (e.g., either in RAM, ROM, or magnetic or optical Read/Write devices) at the cable headend 208 as well as in memory (RAM and/or ROM) within each subscriber's set top terminal 220. In the preferred embodiment, two-way communications between the network controller 214 and set top terminal 220 will occur over cable lines. Many other methods of communication, including those which do not require cables or wires, may be used with the present invention. Using two-way communication, interactive television programming can be accommodated through the network controller 214. In addition, the preferred network controller 214 will be able to access set top terminals 220 via phone lines for trouble shooting, special features or sophisticated reprogramming.

The network controller CPU 224 controls the interface, depicted at 211, between the network controller 214 and the signal processor 209. This interface 211 allows control information to flow or transfer between the two cable headend 208 components. Standard RS-232 or RS-422 links, an IEEE-488 bus or other interface media may be used. During standard operation, program control information is

passed through this interface 211 to the network controller CPU 224 from the signal processor 209 (i.e., the program control information having been sent to the signal processor 209 over satellite from the operations center 202 with the RF program signals 205, not shown in Figure 5). The network controller CPU 224 processes the program control information based on data stored in the network control databases. This processing includes modifying the program control information to accommodate regional programming needs.

After processing, the network controller CPU 224 passes the program control information, including any modifications, back to the signal processor 209 for distribution over the cable system 200, via the cable distribution network 236. In this fashion, the network controller 214 provides programming and network control instructions to the set top terminals 220 through the signal processor 209.

The processing of program control information by the network controller CPU 224 can also make use of any data received by the network controller's control receiver 228. The control receiver 228 is a microprocessor-based device that receives "status reports" directly from the set top terminals 220. The status reports received by the control receiver 228 generally include information that allows the network controller 214 to track, among other things, a subscriber's program access history, as described below. The control receiver 228 can store the status reports internally in a local storage or memory device and transfer them to the network controller CPU 224. Typically, the control receiver 228 is interfaced with the network controller CPU 224 using

standard RS-232 or RS-422 links, an IEEE-488 bus or the like.

5 In the preferred embodiment, the network controller CPU 224 scans the control receiver 228 at a predetermined rate (e.g., once every few seconds) to initiate the status report transfer. Upon transfer, the network controller CPU 224 adds the data and control information in the status reports to the network control databases 226 by: checking for changes in previously received status information, processing the new
10 information and updating the corresponding parameters in the network control databases 226. The network controller 214 processes the information stored in its databases with any program control information relayed through the signal processor 209 from the delivery system's operations center
15 202. This processing capability allows the network controller 214 to modify prior control signals and create new ones. The network controller 214 transfers both modified and unmodified control signals, along with any local combined program signals 205, to the signal processor 209 to be
20 combined with others program signals 205 for distribution over the cable system 200.

3. Modifying the Program Control Information Signal

25 Tables A-C, described below, provide an example of some information that can be sent in the program control information signal to the set top terminals 220. The program control information signal generated by the operations center 202 provides data on the scheduling and description of
30 programs. The program control information signal may be sent through the network controller 214 or, in an alternate configuration, directly to the set top terminal 220 for display to the subscriber. In the preferred embodiment, the

program control information signal is stored and modified by the network controller 214 and sent to the set top terminal 220 in the form of a set top terminal control information stream (STTCIS). This configuration can accommodate, among other things, differences in individual cable systems and possible differences in set top terminal 220 devices.

The set top terminal 220 integrates either the program control signal or the set top terminal control information stream together with data stored in the memory of the set top terminal 220, to generate on-screen menu displays for assisting the subscriber in choosing programs for viewing. (Throughout the description the term "program control information" is being used to indicate control information coming from the cable headend 208 to the set top terminal 220, whether it is sent directly from the operations center 202, processed by the network controller 214 and then forwarded to the set top box (STTCIS), or transmitted over telephone lines.)

The types of information that can be sent using the program control signal includes: number of program categories, names of program categories, what channels are assigned to a specific category (such as specialty channels), names of channels, names of programs on each channel, program start times, length of programs, description of programs, menu assignment for each program, pricing, whether there is a sample video clip for advertisement for the program, and any other program, menu or product information. In addition, the program control information signal may be used periodically to reprogram or reconfigure a set top terminal 220 or group of set top terminals 220 (described in detail in co-pending patent application Ser. No. PCT/US93/11708, entitled REPROGRAMMABLE TERMINAL FOR

SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM. filed by the same assignee).

5 The goal of the menu driven program selection system
200 used with the present invention is to allow the
subscriber to choose a program by touring through a series of
menus utilizing a remote control 900 (Figure 3) or similar
device providing cursor movement. The final choice in the
series of menus will identify one particular channel and one
10 time for activation of that channel. Armed with a channel and
activation time, the set top terminal 220 can display the
selected program on the television for the viewer. To achieve
this goal one embodiment of the present invention assigns an
intelligent alpha-numeric code to each program. This alpha-
15 numeric code identifies the category of the program, the
menu in which the program should be displayed, its
transmission time(s), and the position on the menu that the
program should be displayed.

 In this embodiment, the program control information,
including menu codes, is sent continuously from the
20 operations center 202 to the network controller 214, and
ultimately to the set top terminal 220. For example, four
hours worth of programming information can be sent via the
program control information signal continuously using the
information shown in Tables A-C.

25 Table A shows the basic programming information that
may be sent to the set top terminal 220. The program
descriptions shown are coded abbreviations. For example, C
for comedy, N for news, S for sports, A for cartoons, and TX
30 for text. If there is a textual description for a program, such
as a movie, the description may be given following that
program's coded description or may be communicated

following the four hours' worth of programming information. As is shown in the coded listing, program descriptions for programs greater than a half hour in length need not be repeated (each half hour). The video description code
5 informs the set top terminal 220 of whether there is still or live video available to advertise the program.

For example, a sporting program may be assigned a code of B35-010194-1600-3.25-Michigan St. vs. USC. The letter B would assign the program to category B, sports. The
10 second alpha-numeric character number 3 would assign the program to the third menu of the sports category. The third character of the code, number 5, assigns the program to the fifth program slot on the third menu. The next six characters, 01/01/94, represent the date. The following four
15 characters, 1600 represent the start time which is followed by the length of the program and the program name. This entry represents a sports show, a college football game, which will be aired at 4:00PM on New Years day 1994.

TABLE A

PM

	*Program name	*Program length	*Menu code	*Description	*Video
	Cheers	.5	E24	C	N
5	Terminator	2.0	A33	Tx	S
	PrimeTime	1.0	D14	N	N
	Football Special	.5	E24	S	N
10					

12:30 PM

	*Program name	*Program length	*Menu code	*Description	*Video
15	1 Simpsons	.5	E14 & C13	C	S
	4 Football Game	3.0	B13	S	N
	.				
	.				
	.				
20	.				

In the 12:30 Channel 1 entry of Table A, two menu codes are shown. By allowing two menu codes, programs that may fit under two different category descriptions may be shown in both menus to the subscriber. With this minimal amount of information being communicated to the set top terminal 220 on a regular basis, the terminal is able to determine the proper menu location for each program and the proper time and channel to activate for the subscriber after his menu selection.

Table B shows an example Events Table that may be downloaded to a set top terminal 220 using the Event Data file, which contains information about events and pricing. As shown in the table, the three columns of the Events Table identify the field number, the field itself and the type of information downloaded in the Event Data file. The first column contains the field numbers 1 through 11. The middle column contains the corresponding field parameters, including the event type, event ID, global channel ID, price, start time, end time, start date, end date, P- icon, name and

description. The third column contains corresponding field type information. As shown in this field type information typically consists of an unsigned integer; hours, minutes and seconds; months, day and year; and ASCII character identifier.

TABLE B

Field #	Field	Type
1	Event Type 1 = YCTV™ 2 = Pay-Per-View 3 = Reg. TV	Unsigned Int
2	Event ID	Unsigned Int
3	Global Channel ID	Unsigned Int
4	Price (in Cents)	Unsigned Int
5	Start Time	HH:MM:SS
6	End Time	HH:MM:SS
7	Start Date	MM/DD/YY
8	End Date	MM/DD/YY
9	P-Icon	ASCIIZ
10	Name	ASCIIZ
11	Description	ASCIIZ

Table C shows an example Event Data file. In particular, Table C shows two data streams corresponding to two event types. The first data stream identifies a YCTV™ event in the first field. The second field designates the event ID, which is 1234 in this example. The third field includes the global channel ID number two. The fourth field indicates the cost of 50 cents for this event. The fifth and sixth fields indicate the respective start and end times of 3:00 a.m. to 3:00 p.m., respectively. The seventh and eighth fields show

the corresponding start and end date, designated as 8/25/93 and 8/27/93, respectively. Field nine indicates the P icon set to PBS.PCX graphics file. Finally, fields ten and eleven indicate the name and description of the event selected, which in this case is Sesame Street and Barney. The second data stream in the Event.Dat example shown in Table C includes analogous information for Terminator IV, which is designated in field one as a pay-per-view event.

TABLE C

10 **Event Data Example**

1	1234	2	50	03:00:00	15:00:00	08/25/93	08/27/93	pba.pcx	Sesame Street & Barney's Sesame Street and Barney Abstract
2	1234	2	50	20:00:00	22:00:00	08/25/93	08/25/93	t4.pcx	Terminator 4 Terminator 4 Abstract

15

The program control information signal and STTCIS can be formatted in a variety of ways and the on-screen menus can be produced using different methods. For instance, if the program control information signal carries no menu format information, the menu format for creating the menus can be fixed in ROM at the set top terminal 220. This method allows the program control information signal to carry less information but has the least flexibility since the menu formats cannot be changed without physically swapping the ROM holding the menu format information.

20

In the preferred embodiment, the menu format information is stored at the set top terminal 220 in temporary memory, either in a RAM or EPROM. This configuration provides the desired flexibility in the menu format while still limiting the amount of information needed to be communicated through the program control information signal. New menu format information would be sent using the program control information signal or the

25

30

STTCIS to the set top terminals 220 each time there was a change to a menu.

In the simplest embodiment, the menus remain fixed and only the text changes. Thus, the program control information signal can be limited to primarily text and a text generator can be employed in the set top terminal 220. This simple embodiment keeps the cost of the set top terminal 220 low and limits the bandwidth necessary for the program control information. Another simple embodiment uses a separate channel full-time (large bandwidth) just for the menu information.

4. Processing the Program Control Information Signal

Figures 6a and 6b show a more detailed schematic of the components of the cable headend 208, focusing on the interplay between the network controller 214 and the signal processor's 209 major hardware components. The network controller 214 uses, among other components, the signal processor 209 to implement its monitoring and control capabilities. Although the network controller 214 of the present invention will work with nearly any cable headend signal processing equipment, it is preferred that the signal processing equipment be modern equipment capable of handling digitally compressed video.

Figure 6a depicts an embodiment of the basic signal processing capabilities of the cable headend 208 and shows connections to components of the network controller 214. As shown in the figure, RF cable signals 205 are received at the headend 208 through a bank of integrated receiver demodulators (IRDs) 240. Each IRD 240 includes customary RF processing equipment, including a low noise amplifier, a demodulator and other filtering devices (not shown). As each

RF feed is fed through the individual IRDs 240, the signals are manipulated and transferred to the demultiplexer and other signal processing equipment for further processing. The demultiplexer 242 splits each cable TV signal into its
5 respective video and audio signal components. In addition, the demultiplexer 242 extracts data from the cable television signals and inputs such data to the control CPU 244.

The control CPU 244 exchanges control information with the network controller 214, as shown at 211. This
10 control information is exchanged between the signal processor's control CPU 244 and the network controller CPU 224. In particular, the network controller 214 and signal processor 209 pass control information through the interface linking the two CPUs in order to perform any modifications
15 to the program control information signal. The network controller CPU 224 oversees such modifications, accessing various network control databases 226 for guidance in instructing the signal processor's control CPU 244. The instructions provided by the network controller 214 in turn
20 guide the signal processor 209 in combining and/or adding programming signals and advertisements for transmission to the set top terminals 220.

The local insertion component 246 of the signal processor 209 allows the control CPU 244 to execute the
25 instructions received from the network controller 214 and insert any local programming and advertisements. Once such regional programming and advertisements have been inserted, the local insertion component 246 passes the various signals to a multiplexer 248 that combines the various
30 programming and advertising signals. The output of the multiplexer 248 is transferred to RF modulator 250 that disseminates the composite video and audio signals to the set

top terminals 220. The data extracted from the cable television signals by the demultiplexer 242, which is also sent to the control CPU 244, is transmitted to the set top terminal 220 using a separate RF modulator 250.

5 The network controller 214 accommodates two-way RF data communications with the set top terminals 220. Upstream data transmissions from the set top terminals 220 are received by the network controller's control receiver 228. These upstream data transmission capabilities are
10 described in detail below.

 Figure 6b diagrams another embodiment of a basic cable headend 208 having a network controller 214 and more sophisticated signal processing equipment. Again, RF cable television signals 205 are fed into a bank of IRDs 240 as
15 described above. These signals 205 are demultiplexed into individual video and audio signal components, with data being extracted and sent to the control CPU 244. The individual video and audio signal components are fed into a digital logic circuit 256 that is flexible enough to select individual video
20 and audio signals for repackaging. The network controller 214 oversees such repackaging by: (i) receiving the program control information from the control CPU 244, (ii) modifying or manipulating the signal as necessary, and (iii) transferring the modified program control information signal back to the
25 control CPU 244.

 With instructions from the network controller 214, the control CPU 244 may insert local avalls into the digital logic system 256 and execute the various selections of individual
30 video and audio signals for subsequent transmission to the set top terminals 220. Once individual video and audio signals have been selected and all local insertions have been made, the outputs of the digital logic circuitry 256 are transferred

to a serializer 258 which recombines all the signals into a serialized format. The serially-formatted signals are in turn transferred to RF modulators 250 for distribution over the cable network 200. The selection and recombining components of the signal processing equipment are described in greater detail in a co-pending Patent Application, Ser. No. PCT/US93/11615, entitled DIGITAL CABLE HEADEND FOR CABLE TELEVISION DELIVERY SYSTEM, however, such sophisticated combining circuitry is not necessary for the operation of the network controller 214. Rather, a simpler signal processing system may readily be used.

In the embodiments diagrammed in Figures 6a and 6b, the signal processor 209 may, acting alone or in conjunction with control instructions from the network controller 214, incorporate local programming and/or local advertisements into the program signals and forward the revised signal to the set top terminals 220. To accommodate this local programming availability, the signal processor 209 must combine the local signal in digital or analog form with the program signals 205 received from operations center 202. If a local cable system 200 uses a compression algorithm or standard that is different than the one used by the operations center 202, the signal processor 209 must also decompress and recompress incoming signals so they may be properly formatted for transmission to the set top terminals 220. In addition, the signal processor 209 performs any necessary signal decryption and/or encryption.

Figure 7 diagrams an alternative embodiment of a digital/analog cable headend 208. In particular, this embodiment includes decompression and recompression capabilities, showing the types of signal processing

components that the network controller 214 may control. As shown in Figure 7, the cable headend 208 receiver front-end, indicated at 260, demodulates the received transponder signals 205, which may contain four, six, eight or more audio/video channels of information, into a digital bit stream of multiplexed digitized MPEG or MPEG 2 format video. The signal processor 209 receives the multiplexed signals and initially performs any demultiplexing required to process the received signals. The demultiplexers 242 separate the multiplexed signals into separate individual MPEG or MPEG 2 format digital channels. Depending on the transponder signal received, the demultiplexer 242 may have four, six, eight or more cross connects to the combiner 264. The outputs of the demultiplexers 242 are selectively enabled by the control CPU 244. Those outputs of the multiplexer 248 that are enabled are then input to the combiner.

Decrypting may be necessary and can be conducted by a separate decrypting device 262 included as part of the signal processor's internal components. The signal processor's control CPU 244 may be controlled by a remote site (such as a national site) via a modem or similar connection 266. Therefore, the remote site is able to control the output of the demultiplexers 242. Alternatively, instead of enabling the outputs of the demultiplexers 242, the inputs of the combiner 264 may be selected by the control CPU 244. By enabling or selecting multiplexer 248 outputs, the control CPU 244 is able to control which television programs are combined and transmitted to the viewers.

The combiner 264 combines the enabled or selected outputs of the demultiplexers 242 into the proper format and outputs the signals through a compressor 268, and an encryptor 270 (if desired), to a digital modulator 272. The

modulator 272 outputs a modulated RF carrier combined with other carriers onto the cable distribution network 236. The set top converter terminals 220 in subscribers' homes select and demodulate a particular channel selected by the user. As
5 selections are made, the set top terminal 220 stores the programs accessed in its local storage for later transmission to the network controller 214 at the cable headend 208.

5. Changing Menu Content by Modifying the Program Control Information Signal

10 Figures 8a through 8c are sample menu screens produced by a set top terminal 220 using the program control information signal. Figure 8a shows a menu which enables the viewer to select a program category from among a
15 choice of eight program categories 1048. Figure 8b shows a menu 1050 for the viewer to select a hit movie from among ten hit movies 1052. Figure 8c depicts a menu 1054 which provides information about a movie and enables a viewer to order the movie for viewing.

20 Figures 8a through 8c show text generated by a set top terminal 220. This text is generated using information received via the program control information signal by a text generator (not shown) in the set top terminal unit 220. Those portions of the text that generally remain unchanged
25 for a period of weeks or months may be stored in EEPROM or other local storage. For example, the text "HIT MOVIES from" 1056 will consistently appear on each hit movies' major menu. This text may be stored on EEPROM or other local storage. Further, text such as that which appears at the
30 lower center part of the screen "PRESS HERE TO RETURN TO CABLE TV" 1058 appears many times throughout the menu sequence. This text may also be stored locally at the set top terminal 220.

Text which changes on a regular basis, such as the movie titles 1052 (or other program selections), will be transmitted to the set top terminal 220 by either the operations center 202 or the cable headend 208. In this manner, the cable headend 208 may change the program selections available on any menu by modifying the program control information signal sent by the operations center 202 and transmitting the change.

It is preferred that the text, e.g., 1048, 1052, 1056, etc., be generated by the set top terminal 220 separately from the graphics because the text can be stored locally in a more compact manner requiring less storage space at the set top terminal 220. In addition, it allows for easy communication of text changes from the operations center 202 or cable headend 208 to the set top terminal 220.

Figures 8a through 8c show the use of day, date and time information 1060 on menus. This information may be obtained in a variety of ways. The day, date, and time information 1060 may be sent from the operations center 202, the cable headend 208 (signal processor 209 or network controller 214), the uplink site 204, or generated by the set top terminal unit 220 internally. Each manner of generating the day, date, and time information 1060 has advantages and disadvantages which may change given the particular embodiment and costs.

In the preferred embodiment, the day, date, and time 1060 are generated at a central location such as the operations center 202 and are adjusted for regional changes in time at the cable headend 208. In particular, the network controller 214 modifies the PCI signal to accommodate regional day, date and time information and changes and additions in regional programming and advertisements.

These modifications are automatically processed by the network controller CPU 224 upon initiation of the Modifying PCI software routine, as described below. In an alternate embodiment, the network controller's control station operator can manually enter programming, advertising and menu modifications.

6. Receiving Information from Set top Terminals

The network controller 214 is equipped to receive information from the set top terminals 220 on a regular or random basis. Figures 9a and 9b diagram separate embodiments for upstream data transmission for a digital/analog cable headend 208. In particular, Figure 9a diagrams an out-of-band two-way data transmission system 280 wherein satellite feeds 282 are received at the cable headend 208 by a number of satellite receivers 284 and digital signal processing equipment 286. The satellite receivers 284 are used for analog transmissions and the digital signal processing equipment 286 is used to process digital programming signals. The analog signal paths allow analog cable television programming signals to be received by the set of satellite receivers 284 and to be passed to a series of modulators and scramblers 288 the output of the modulators and scramblers 288 is sent to an RF combiner 290.

A data transmitter (Data Tx) 292 makes use of the control information transferred to the signal processing equipment from the network controller 214. This data transmitter inserts data into the RF combiner 290. Through the use of a separate data transmitter, any downstream data transmissions may be sent to a set top terminal 220 on an

out-of-band frequency (i.e., out of the frequency band used for video signal transmissions).

Digital signals are also input to the RF combiner 290 from the digital signal processing equipment 286. These digital signals are typically assigned to separate frequency bands. Once the data, analog and digital signals have been combined using the RF combiner 290, the composite signals are further processed at the cable headend 208 for distribution over the cable network. This further processing involves using a duplex filter 294 that accommodates two-way RF communications over the cable distribution network.

The duplex filter 294 requires that the various sets of signals be translated to different frequency bands. Typically, services to the home are sent in a downstream band, which begins at 54 MHz and extends today to typically 550 MHz. Other systems that use a maximum frequency less than or greater than 550 MHz, however, may readily be accommodated by the embodiment shown in Figure 9a. Downstream services may include TV channels, FM radio, digital/audio signals and various control and information data streams.

Upstream transmissions from the set top terminal 220 are typically sent in the frequency band between 5 and 50 MHz. Other frequency limits may, however, be employed in special cases. For example, the industry is currently experiencing movement toward using 5 to 42 MHz for upstream services.

Although the duplex filter 294 is not an inherently bi-directional device, it may be made bi-directional by splitting the spectrum between downstream and upstream signals, as described above. The duplex filter 294 effectively becomes bi-directional by passing high-band signals in the downstream

direction and passing low-band signals in the upstream direction. For downstream transmission capability, all signals in the high-band of 50 to 550 MHz are passed to a fiber/coax translation point, indicated generally at 300.

5 At the fiber/coax translation point 300, optical energy is relayed to the various optical nodes 304. This distribution of optical energy typically involves splitting the optical energy among the nodes 304 and transporting the energy downstream on one or more downstream fibers. In addition,
10 electrical energy signals are sent over coaxial cables, through a series of amplifiers 306 along the cable for distribution to individual subscribers. Individual subscribers simply tap into the amplifiers along the coaxial cable in order to receive programming and downstream data signals.

15 Upstream data transmission are sent to the cable headend 208 from each optical node 300 over fiber and input into the cable headend's RF combiner 308. Upstream transmissions over cable are accommodated using carrier frequencies in the lower frequency band. These upstream
20 data transmissions over the coaxial cable are passed through the diplex filter 294, which filters out all high-band frequencies and passes all low-band frequencies. Subsequently, the diplex filter 294 transfers such low-band frequencies to the RF combiner 308. The RF combiner 308
25 combines all upstream data transmissions from the set top terminals 220 and inputs these combined data signals into the network controller 214 for later processing.

30 Figure 9b shows an alternative embodiment to Figure 9a. In particular, Figure 9b shows the same overall configuration as the embodiment above (and is commonly numbered) although downstream data transmissions from headend 208 to the set top terminals 220 are accomplished

through in-band two-way data transmission. Thus, the primary difference between the diagrams shown in Figures 9a and 9b is that the latter embodiment uses a method of inserting data into the downstream programming signals themselves for distribution to the set top terminals 220 in the cable network.

Basically, the data placed on the programming signals using a set of data inserters 312 that are electrically connected to each modulator and scrambler component 288. In this way, data can be inserted in-band along with video and audio signals, thereby modulating the data on the same respective carrier frequencies used by the video and audio signals. The inserted data is thus combined with video and audio signals and input into the RF combiner 290 for downstream distribution. As described above, digital signals are also combined using the RF combiner 290 and disseminated over the cable network. Upstream transmissions are accomplished as described above in conjunction with the discussion for Figure 9a.

Upstream information received from the set top terminals 220 typically includes, for example, program access data gathered at each set top terminal 220. Such information may be communicated to the network controller 214 through a variety of methods including any of the following methods: (1) cyclic polling, (2) random access, and (3) telephone modems. Cyclic polling and random access methods make use of the two-way RF system diagrammed in Figures 9a and 9b, described above.

As described below, the preferred embodiment employs a cyclic polling method. Although various polling schemes will work with the present invention, a roll-call polling scheme is preferred over other schemes such as hub

polling or token-passing since roll-call polling provides the greatest degree of centralized control.

Using this preferred method, program access information is stored at each set top terminal 220 until it is
5 polled by the network controller 214 for information retrieval using a polling request message format 920 as shown in Figure 10a. This frame format 920 may include such program control information as shown in Tables A-C above, typically consisting of six fields: (1) a leading flag 922 at the beginning
10 of the message, (2) an address field 924, (3) a subscriber region designation 926, (4) a set top terminal identifier 928 that includes a polling command/response (or P/F) bit 930, (5) an information field 932, and (6) a trailing flag 934 at the end of the message.

15 The eight-bit flag sequence that appears at the beginning and end of a frame, 922 and 934, respectively, is used to establish and maintain synchronization. Such a sequence typically consists of a "01111110" bit-stream. The address field 924 designates a 4-bit address for a given set
20 top terminal 220. The subscriber region designation 926 is a 4-bit field that indicates the geographical region in which the subscriber's set top terminal 220 is housed. The set top terminal identifier 928 is a 16-bit field that uniquely identifies each set top terminal 220 with a 15-bit designation
25 followed by an appended P/F bit 930. Although field size is provided by this example, a variety of sizes can be used with the present invention.

The P/F bit 930 is used to command a polling response from the set top terminal 220 addressed, as described below.
30 The frame format 920 also provides a variable-length information field 932 for other data transmissions, such as information on system updates. The frame format 920 ends

with an 8-bit flag 934 (or trailing flag) that is identical in format to the leading flag 922, as set forth above. Other frame formats will be apparent to one skilled in the art and can be easily adapted for use with the system.

5 Using any such polling request message format 920, the network controller 214 interrogates each set top terminal 220 sequentially, one by one. In this type of access strategy, the network controller 214 is designated as the
10 central controller of the cable distribution network 200 and is responsible for control of the communications links between itself and the set top terminals 220. This control includes issuing commands to the set top terminals 220 and receiving responses back from the set top terminals 220.

15 Basically, the network controller 214 instructs the signal processor 209 to transmit to each set top terminal 220 a polling request, which asks whether a set top terminal 220 has any information to transmit. The set top terminals 220 are identified by the unique address and set top terminal identifier 928. It is preferred that the set top terminal 220
20 transmit information and messages to the network controller 214 only when given permission by the network controller 214 to do so.

25 Where, for example, specialty programs have been accessed since the previous poll, the set top terminal 220 is given permission to transmit a polling response in the form of a status report that includes any such access information. The network controller's control receiver 228 is tasked with the receipt of set top terminal 220 polling responses or status reports. These status reports generally include
30 information that allows the network controller 214 to track a subscriber's program access history. As described above, the

control receiver can store the status reports locally and/or transfer them to the network controller CPU 224.

5 The network controller CPU 224 immediately processes each polling response as it is received from each set top terminal 220. The network controller CPU 224 updates pertinent databases 226 with the received information, and then sends another polling request to the next set top terminal 220 on its list. A set top terminal 220 with no information to transmit so indicates in a reply to the
10 network controller 214. Once all set top terminals 220 have been given permission to transmit status reports, a cycle is complete and a new cycle begins.

Through a polling cycle, the network controller 214 acquires the information needed to operate the system 200.
15 During the cycle, the network controller 214 sends signals to the set top terminals 220 to authorize both their operation and access to specific channels. If, for example, a subscriber has failed to pay a recent bill, the network controller 214 can deauthorize the subscriber's set top terminal 220. Likewise,
20 when a subscriber orders a program or channel, the network controller 214 checks the subscriber's account for good standing by reading the proper database file. After the check, the network controller 214 then either authorizes or deauthorizes access by the set top terminal 220 using the
25 data transmitted in a modified program control information signal. As a result, the cycle requires a series of requests and responses to operate.

Figure 10b shows an example frame format 920' for the status reports received from the set top terminals 220 during
30 the polling cycle. This frame format is substantially identical to the polling request message format 920 (Figure 10a), and includes: (1) a leading flag at the beginning of the message.

(2) an address field, (3) a subscriber region designation, (4) a set top terminal identifier that includes a polling command/response (or P/F) bit, (5) an information field, and (6) a trailing flag at the end of the message, each designated by a common number with respect to Figure 10a, but with the prime indicator (') added.

Again, the information field 932' remains variable in length so that the status of an indeterminate number of programs accessed, as represented at 933', can be included in the frame. In this way, the control message length of the polling request message is minimal since the network controller 214 does not transmit such access information. After a polling response by a given set top terminal 220, however, the control message length increases in proportion to the number of programs accessed.

During transmission, the P/F bit 930, 930' is used to carry out the polling function. In particular, the P/F bit 930 is set to a "1" position to command a polling response from the set top terminal 220 whose address is identified in the frame 928. The set top terminal 220 addressed must respond to the command with the same P/F bit 930' also set to the "1" position. The response will include the number of programs accessed and their corresponding event identification numbers as shown in Figure 10b at 933'. In cases where the set top terminal 220 has not accessed any programs since the previous polling cycle, the set top terminal 220 responds with the P/F bit 930' set to "1" and the programs access block denoting zero programs accessed.

The second method for the network controller 214 to receive information from the set top terminals 220 is through the use of a random access scheme. In an alternate embodiment that uses this method, individual set top

terminals 220 can send control-related messages to the network controller 214 without being polled. This scheme is particularly useful in networks where subscriber regions include potentially large numbers of subscribers. High concentrations of subscribers may be found, for example, in large metropolitan areas. In such cases, the polling cycle can be replaced with a more sophisticated random access strategy such as carrier-sense multiple access with collision detection (CSMA/CD). In this scheme, each set top terminal 220 must "listen" before it transmits and then does so only if it senses an idle medium. When the return link to the network controller 214 is silent, a given set top terminal 220 can transmit its messages. Any messages sent from a set top terminal 220 to the network controller 214 would set the P/F bit 930' to a "0" position to indicate that the message is not in response to any command or polling request. In addition to CSMA/CD, other random access schemes can be used with the system, such as CDSL.

The third method for the network controller 214 to receive information from the set top terminals 220 is through the use of telephone modems. In an alternate embodiment, the set top terminals 220 communicate program access information and orders to the network controller 214 using telephone modems. In this embodiment, the set top terminals 220 are equipped with a modem port to facilitate such operation. Thus, communications between a given set top terminal 220 and the network controller 214 can be established over telephone lines when cable traffic or other primary traffic is congested. The preferred method of using telephone modems is in combination with a control or "hit" signal from the network controller 214. A group (or region) of set top terminals 220 is "hit" simultaneously by the

network controller 214 via the cable. Only those set top terminals 220 within the group that have data for the network controller 214 call the network controller 214 by modem. The network controller 214 is equipped with a bank
5 of modems (organized to roll-over telephone calls) to answer the incoming calls.

Among the three methods discussed for the network controller 214 to receive information from the set top terminals 220, the use of the cyclic polling scheme depicted
10 in Figures 10a and 10b, is preferred. Polling is preferred because it allows the network controller 214 to conduct and control communications with set top terminals 220 over the cable network in an orderly fashion. In particular, the network controller 214 can schedule data retrieval by polling
15 the set top terminals 220 one by one. A random access method, on the other hand, does not allow the network controller 214 to maintain such orderly communications. Instead, the network controller 214 receives data from the set top terminals 220 at random, depending on when the
20 cable medium is idle. This random reception of data lessens the degree of control that the network controller 214 has over set top terminal transmissions. Likewise, the third method, which uses telephone modems, is less desirable than the polling method since the use of modems does not allow
25 for upstream interactivity over the cable medium.

7. Processing Information Received from Set top Terminals

Regardless of the scheme used by the set top terminals
30 220 to access the network controller 214, any polling responses and upstream interactivity is received by the network controller's control receiver 228 as shown in Figure 11, depicting the components of the control receiver 228.

which includes a demodulator 310 and demultiplexer 313 to demodulate and demultiplex transmissions received from any set top terminal 220 in the cable distribution network 200. As described above, the control receiver 228 transfers,
5 through a control buffer 315, the received information to the network controller CPU 224 for processing.

Processing is accomplished by the network controller CPU 224. Operator instructions are input to the network controller CPU 224 through the operator control station 234
10 that includes, for example, a computer/workstation with a CRT display, printer and other peripherals. Multiple operator control stations 234 can be used to assist in control operations.

Regional operator control stations (not specifically
15 shown, but substantially identical to stations 234) may be used and may include multiple operator control stations each assigned to a particular subscriber region corresponding to a geographic region where set top terminals 220 are located. Thus, each regional operator control station is assigned to a
20 subscriber region, providing monitoring and control capabilities over such regions. All regional program control information is transferred to the network controller CPU 224 for processing, as in the case where a single control station 234 is used. Likewise, during this processing, portions of the
25 network control databases 226 may also be updated.

No set number of databases 226 are required for the network controller 214 to perform its operations, and a single temporary database may be used. In the preferred embodiment, however, the network controller 214 uses
30 several databases (indicated at 226) that are accessed during network control operations. These databases 226 are identified in Figure 11 and include: (1) the Viewer Profile

database 314. (2) the Account/Billing database 316. (3) the Program Library database 318. (4) the Program Scheduling database 320. (5) the Advertisement Library database 322. and (6) the Advertisement Scheduling database 324.

5 Figure 12 shows one example of a network controller's basic database structure including the databases identified in the preceding paragraph. The data stored in these databases is not simply raw data. Rather data may be processed, correlated and appropriately indexed to create a true
10 relational database 226.

 As shown in Figure 12, the Viewer Profile database 314 includes: (i) a Set top ID File, (ii) a Subscriber Region File, (iii) a Customer ID File and (iv) a Viewer Log File, the latter three files being indicated generally as a file group 332. The
15 Set top ID File 330, common to each of the databases comprising the network controller's database 226, contains set top converter records with each record representing a unique set top terminal 220. Examples of information stored in this file includes set top terminal type, software version
20 and set top terminal identification/serial number. The Set top ID File 330 contains the key data that links each relational database with one another, as described below.

 The Subscriber Region File, part of file group 332, includes information such as headend 208 assignment,
25 regional operator control workstation assignment and a designation for the subscriber's geographical area. The Customer ID and Viewer Log Files, part of file group 332, include the subscriber's personal information, such as name, address and telephone number, and information on the
30 subscriptions to cable services for each customer as well as a personal profile for each viewer, respectively.

The personal profile consists of demographic information that may be gathered in a number of ways. The set top terminal 220 builds the personal profile for each viewer and stores the information in a memory file by viewer name. To build a personal profile in the preferred system, the viewer answers a series of questions presented on a series of menu screens. These personal profile screens request the viewer to input information such as name, sex, age, place of birth, place of lower school education, employment type, level of education, amount of television program viewing per week, and the number of shows in particular categories that the viewer watches in a given week such as, sports, movies, documentaries, sitcoms, etc. Any demographic information which will assist the set top terminal 220 in targeting advertisements to the viewer may be used.

In addition to gathering demographics at the set top terminal 220, the personal profile can be compiled using other methods. For instance, the information can be gathered using questionnaires sent by mail and subsequently entered in the Viewer Profile Database 314 by the network controller's control station operator.

As an alternative to gathering demographic data, a simulated profile can be generated using an algorithm similar to that described below that analyzes access history and viewing habits. Using test information generated from a statistically significant number of viewers, the simulated profile algorithm estimates the viewer's age, education, sex and other relevant information. The analysis requires reviewing the viewer's programs watched and statistically comparing the viewer's programs watched with the test group. Also, the algorithm can place the subscriber or viewer

in a viewer category. This analysis is transparent from the subscriber's point of view and attempts to accurately profile the viewer. Various viewers or viewer categories can later be targeted with different advertisements.

5 The Account/Billing database 316 includes (i) the Set
top ID File 330, and (ii) an Account History File, and (iii) a
Billing File, the latter two files indicated at 338. The Set top
ID File, as described above, contains information unique to
10 each subscriber, including set top terminal type, software
version and set top terminal identification/serial number.
The Account History and Billing Files contain information
concerning each subscriber's past bills and account record
and information on the most recent bill, including data from
which the next billing report can be generated, respectively.

15 The Program Library database 318 include (i) the Set
top ID File 330, and (ii) a Programs File, (iii) a Preview File,
(iv) a Program Category File, (v) a Price Category File and (vi)
Service File, the latter five files identified at 344. As usual,
the Set top ID File identifies each set top terminal 220 by
20 identification number. The Programs File contains
information on every program offering in the system,
including name, length and type of program. The Preview
File contains information on previews for specialty programs
stored in the Programs File. The Program Category File
25 contains a set of categories into which each program may be
placed, such as movies, sports, science fiction and news. The
Price Category File contains information on pricing for various
categories of programs, grouping programs and services into
categories by price. The Service File maintains information
30 on the various cable services available in the system 200.

 The Program Scheduling database 320 includes (i) the
Set top ID File 330, and (ii) an Access History File, (iii) a

Programs Watched Matrices File and (iv) a Program Scheduling Library, the latter three files indicated at 350. The Access History File contains information on the programs that the set top terminal 220 has accessed and the Programs Watched Matrices contains information on the number of programs watched in a given program category during different times of day. Relative to the Programs Watched Matrices file, a programs watched matrix is shown in Fig. 16 and further described below. The Program Scheduling File contains information on the times of day and the corresponding programs that are being offered for viewing at each subscriber location.

The Advertisement Library database 322 includes (i) the Set top ID File 330, and (ii) an Advertisements File, and (iii) an Advertisement Category File, the latter two files being indicated at 354. The Advertisements File contains information on every advertisement in the system, including name, length and type of advertisement, and the Advertisement Category File contains a set of categories into which each advertisement can be placed.

The Advertisement Scheduling database 324 includes (i) the Set top ID File 330, and (ii) an Advertisement Selection File, and (iii) an Advertisement Targeting File, the latter two files identified at 358. The Advertisement Selection File contains information on the advertisements that have been offered to each subscriber and keeps track of the ones that have been selected. The Advertisement Targeting File contains information on the advertisements and advertisement categories that have been chosen by the system as being of the most interest to a specific subscriber.

The network control databases 314, 316, 318, 320, 322, 324 comprising the database 226 are relational

databases generally keyed to information in a single file. Specifically, the relational key is a set top terminal 220 identification number stored in Set top Terminal ID File 330, as shown in Figure 11. This set top terminal identification number allows the database files that correspond to a particular subscriber to be linked together by a common reference. In other words, the databases are structured such that subscribers are referenced in each database file by a unique set top terminal identification number. In this way, each database may be accessed based on set top terminal identification number alone. Thus, using a subscriber's set top terminal identification number, the network controller CPU 224 can access and process information pertaining to that subscriber from any of the above described database files. In configurations where multiple set top terminals 220 are allocated to a single customer (or household), a unique subscriber identification number may be added to the database 226 to group the set top terminals 220 by customer. With the set top terminal identification as a relational key, many additional databases may be created that correlate and store pieces of subscriber-specific information from the six databases and underlying files.

8. Overview of Software Routines

Figure 13 shows the major software routines initiated and executed by the network controller CPU 224. These routines are: (1) the Modifying PCI routine 370, (2) the Polling Cycle routine 372, (3) the Advertisement Targeting routine, and (4) the Account/Billing routine 376. Together, these routines, along with the operator entry and update functions 380, 382, respectively, enable the network controller 214 to perform its major functions.

The Modifying PCI routine 370 is the software that enables the network controller 214 to modify the program control information (PCI) signal received from the signal processor 209. This software routine generally allows the network controller CPU 224 to modify the PCI signal content so that changes and additions in programming and advertisements can be accommodated. Such changes and additions include access authorizations and deauthorizations in the form of authorization and deauthorization messages, respectively.

The Polling Cycle routine 372 is the software sequence that interactively executes the network controller's polling cycle allowing the network controller 214 to schedule and perform polling of all set top terminals 220 operating in the system 200. The software also provides the network controller 214 with a means of processing status reports received from set top terminals 220 in response to polling requests. For a random access system (not depicted), the software of this routine 372 would be changed.

The Advertisement Targeting routine 374 is the software that generates packages of television commercials and advertisements geared towards particular viewers and makes use of a viewer's demographic information and viewing habits to determine those advertisements that are of most interest to that particular viewer. In so doing, the routine 374 outputs packages of advertisements targeted towards each viewer.

The Account/Billing routine 376 is the software that the network controller CPU 224 runs to generate billing reports for each set top terminal 220. In general, the routine 376 correlates the programs accessed with pricing information to generate each report.

9. Modifying PCI Routine

Figure 14 shows a software flow diagram for the network controller's Modifying PCI routine 370. The Modifying PCI routine (or sequence) is initiated, block 384,
5 automatically by the network controller CPU 224 upon receipt of the program control information (PCI) signal from the signal processor 209. Once the network controller 214 receives the PCI signal, the network controller CPU 224 begins processing the signal by reading the PCI data carried
10 by the signal, block 386.

After reading the PCI data, the network controller CPU 224 "calls" other routines to interactively process data and continue the modification process for each set top terminal 220. First, the network controller CPU 224 calls the Polling
15 Cycle routine 372, at block 388, in order to request data retrieval of the information stored at individual set top terminals 220. Such information includes data on the programs accessed and those ordered for later viewing. As polling responses are received from the set top terminals
20 220, the network controller CPU 224 next calls, block 390, the Advertisement Targeting routine 374, which generally arranges groupings of commercials for different subscribers based, in part, on viewer demographic information and program access history.

25 The network controller CPU 224 next calls 392 the Account/Billing routine to begin processing all programming and channel access requests. The Account/Billing routine determines, among other things, whether the subscriber's account is in good standing, verifying that past bills have been
30 paid and that access authorization is warranted. Upon completion of this verification process, a verification message

will be sent to the network controller's operator control station 234 indicating that access should be granted.

5 In the preferred embodiment, an access authorization code may automatically be processed by the network controller CPU 224 and appended to the PCI signal originally received from the signal processor 209. This modified PCI signal and access authorization code will then be transferred back to the signal processor 209 for transmission to the set top terminals 220.

10 With continued reference to Figure 14, in an alternate embodiment that uses the Modifying PCI Routine 370, at blocks 394 and 396, the operator manually enters any changes in programming and menu content, along with access authorizations, into the program scheduling database 320. The manual entry of programming and menu content in
15 this embodiment, blocks 394, 396, requires that the operator access the database information generated and updated by the other routines and make necessary changes in the program scheduling database. The network controller CPU 224 reads
20 this updated database information, generates a modified PCI signal, and sends, block 398, the signal to the signal processor 209.

If a subscriber account is delinquent, access to any new programs or channels ordered will not be authorized.
25 Instead, the network controller CPU 224 will deny authorization and generate a deauthorization message to be included in the PCI signal that will be returned to the signal processor 209 for transmission to the set top terminals 220. Alternatively, the network controller CPU 224 generates a
30 delinquency message that is transferred to the CRT display at the network controller's operator control station 234. Upon reviewing the message, the operator may then manually enter

message text to be included in the PCI signal that informs the subscriber of a delinquent account.

10. Polling Cycle Routine

5 Figure 15 shows a software flow diagram for the network controller's Polling Cycle routine 372, which iteratively executes the network controller's polling cycle. The number of iterations correspond to the number of set top terminals 220 being polled. The network controller CPU 224 initiates the Polling Cycle sequence periodically on a
10 predetermined basis, block 400. Typically, this period is set by the operator at the network controller's operator control station 234 at once per day, although other periods (e.g., multiple times per day or once per week) can be used.

15 Upon initiation of the sequence 400, as depicted at function block 402, the network controller CPU 224 reads the Set top Terminal ID File 330 and begins generating, block 404, a polling request frame (shown in Figure 10a and described herein above) for the first set top terminal 220 identified in the file 330. Once the necessary polling request
20 information is complete, the frame is transferred to the signal processor CPU 244 through the interface between the signal processor 209 and network controller 214. After transfer to the signal processor 209, the frames may be transmitted to the set top terminals 220, block 406. Meanwhile, the network controller's control receiver 228
25 awaits the corresponding response.

30 Upon receipt of a polling response, as depicted at block 408, the network controller CPU 224 reads the received information from the control buffer 315. The network controller 214 reads the information field of the polling response frame format, as described above. The network controller CPU 224 processes, indexes and stores the data in

an appropriate format, updating the corresponding database files with the information received, block 410. The processing and indexing of the raw data into a relational database 226 is important to the ability of the network controller 214 to quickly take actions such as targeting commercials without lengthy processing time. The polling routine subsequently returns to the Set Top Terminal ID File 330, as shown at decision block 412, to continue the polling cycle for the next set top terminal 220 identified in the file 330. When the routine 372 sequences through the last set top terminal 220, the cycle is complete and the routine 372 ceases until the next polling period.

Most often, the files that require updates during the polling cycle are the Access History File and the Programs Watched Matrices File, both indicated generally at 350 in Figure 12, and the Account History File 338. For example, Figure 16 shows an example of a 30-day programs watched matrix, denoted 351, for one set top terminal 220 (not shown in Figure 16). The matrix 351 is divided into six rows, corresponding to six four-hour time slots. The columns of the matrix 351 are divided, as necessary, by the program categories available for viewing. Each entry in the matrix 351 denotes the number of programs watched in a particular program category and time period.

After the status report is received on each set top terminal 220, the polling response routine (see Figures 10a and 10b) determines which time slot and category of program numbers in the matrix 351 need to be increased. Thus, entries in the matrix 351 are updated upon receipt of each set top terminal's polling status report, thereby maintaining a running total of the programs watched. For example, during the 0800-1200 time period, the matrix 351

shows that this set top terminal 220 has been used to watch ten movies during the past month. Preferably the program watched identifying information is stored in addition to the running totals in the Programs Watched Matrices file. Use of
5 programs watched matrices is further described in the following section describing the Advertisement Targeting routine.

11. Basic Advertisement Targeting Routine

10 Figure 17 shows the seven primary functions of the basic advertisement targeting routine 374. The function of this routine is to target video for set top terminals 220 based on historical viewing data and other data that is available at the network controller 214. Advertisements that may be targeted include video, commercials and infomercials, with
15 infomercials being time varying video segments (e.g., thirty seconds, fifteen minutes).

When initiated, block 420, the first subroutine, identified at function block 422, accesses the programs watched matrices (exemplified by matrix 351) stored in the
20 Programs Watched Matrices file in the Program Scheduling database 320. The subroutine uses a unique set top terminal ID to access a specific matrix for one set top terminal 220. These matrices are maintained and updated by the polling response routine.

25 The second subroutine, function block 424, which develops other matrices based on other available information, is an optional subroutine not required for the functioning of the system. For groups of set top terminals 220 or for each individual set top terminal 220, matrices may be developed
30 based on the demographic information, billing information, pricing information, age information and other information which may be stored in the network controller 214 databases.

The third subroutine, block 426, processes all matrices through a set of correlation algorithms. In particular, this subroutine 426 takes matrices developed in the first two subroutines and processes the matrices until reaching a final matrix.

Figure 18 diagrams an embodiment of this matrices processing subroutine 426 which is called by the advertisement targeting sequence shown in Figure 17. As shown in Figure 18, the subroutine 426 is initiated 427 and then accesses or queries, block 428, the programs watched file and gathers information regarding either an individual subscriber or a node of subscribers. The software can gather the programs watched information in this way for individual subscribers or a set of subscribers.

Once the programs watched information has been gathered from the databases, the routine 426 selects and groups, function block 430, programs watched based on program categories and time slots. The software initially takes each program category (e.g., sports, news, movies, etc.) and establishes the number of programs watched for a given time slot. The time slots may be set to any length of time, including, for example, one, two, three or four hour timeframes. The software will loop through such a counting process for each group and timeslot and then proceed to build a programs watched matrix, block 432, based on the program categories and time slots. Essentially, all programs watched in a particular category and time slot will be entered into the programs watched matrix. Once the matrix has been built, the subroutine 426 will process the matrix for a given subscriber or node of subscribers through the correlation algorithms.

A number of correlation algorithms may be used to weight each selected program category group. For example, as shown at block 434, a sum of squares algorithm may be used to determine the weighting. Once the groups have been weighted, the weighted groups will be correlated, as at block 436, with various advertisements stored in the network control databases. The software can then select a set of the most heavily weighted advertisements for transmission to individual subscribers or sets of subscribers in a cable distribution network node. Having determined the weightings of each group and prioritizing the groups accordingly, the subroutine returns 438 to the advertisement targeting sequence 374 of Figure 17.

Referring back to Figure 17, the fourth subroutine, as represented at function block 428, uses the final matrix developed by the correlation and weighing algorithm described above, to select a grouping (or selective filter) for each set top terminal 220. The final groupings of advertisement that may be sent to the set top terminals 220 or node of set top terminals 220 may use a subroutine as diagramed in Figure 19.

The subroutine 428 depicted in Figure 19 is called or initiated by the advertisement targeting sequence 374 of Figure 17 in order to determine the final groupings. Basically, this subroutine selects a set of commercials that will be used in the chosen groupings, function block 444. This selection process typically involves advertisements from various advertisement categories (from a number of advertisers which have purchased "air time"). Each advertisement will subsequently be assigned a number of times that it will be shown in a given timeframe, block 446. This frequency of display may be based on various factors.

including the number of requests and cost paid by the respective advertisers to have the commercial displayed. Such factors are used in the next step of the subroutine, block 448, which assigns a weighting to specific commercials or advertisements in each advertisement category or group. These weightings are used to prioritize the advertisements that will be sent to individual set top terminals 220 or nodes of set top terminals 220.

Once the advertisements have been weighted, the software executes its correlation algorithm, 450, using selected criteria (i.e., the various factors used to weight the advertisements) as well as the output of each programs watched matrix. Any number of correlation algorithms and weighting algorithms may be used with the software, including the sum of squares weighting algorithm described above.

The results from the correlation algorithm subsequently determine the advertisements and programming material that is sent to the signal processor 209 for distribution over the cable network, as represented at block 452. Once the subroutine 428 completes these steps, the network controller CPU 224 updates the account and billing database based on the ads that are sent to the signal processor 209 for subscriber viewing, as shown at block 454. These billing database updates allow the advertisers to track the costs and frequency of the advertisements targeted to specific set top terminals 220 or nodes of set top terminals 220. Following the updates, the subroutine returns to the advertisement targeting sequence shown in Figure 17, block 456.

Referring to Figure 20a, set top groupings (A through E) 460 are shown. The number of set top groupings available

is determined by the bandwidth available to transmit commercials. The bandwidth of the system will limit the number of commercials which are available at the set top terminal 220 at any given time.

5 Referring back to Figure 17, the fifth subroutine, represented at function block 466, prepares set top group information for transmission to the set top terminals 220. This subroutine 466 modifies the PCI signal and includes set top group information in the information field of the frame
10 format given earlier. The various methods for transmitting the group information to the set top terminals 220 are described below.

The sixth subroutine, block 468, selects the target video and is the last decision making process in targeting a
15 commercial for a viewer and, can be performed by either the set top terminal 220 or the network controller 214. In the preferred embodiment, the set top terminal 220 performs this last step by correlating (or matching) the program being watched by the viewer with the set top group information
20 that has been previously transmitted by the network controller 214, and the targeted video is then displayed, as shown at block 470. Figure 20a shows an exemplary table matching set top terminal groups 460 and program category being watched 470 with a specific channel (continuously)
25 showing commercials. The commercial channels are shown in Figure 20b at 474 and are assigned Roman numerals I through X, for example. The number of set top groupings and channels showing commercials can vary. Figure 20b shows a division of available bandwidth to carry ten videos, ten
30 commercial channels. In this example, the channels 474 are numbered 101-110.

The network controller 214 will transmit group information to a set top terminal shown as row names 460 on Figure 20a. The network controller 214 will also transmit data which informs the set top terminal 220 which of the multiple commercial channels 474 is assigned to a television program category shown as Columns 470 on Figure 20a. Each set top terminal 220 only requires the data related to that set top terminal's assigned group (or row). For example, in Figure 20a, the set top terminal in group A (row A) is provided with data on the commercial channel which are assigned for sports programs as I, children's programs as IV and movie category as III. In this manner, each set top terminal 220 is only required to store information related to its own grouping. Therefore, a set top terminal 220 which is in group A only needs to store the information related to group A, which is found in row A of Fig. 20a. This information includes one commercial channel assignment for each of the eight program categories. Using this information, the set top terminal 220 first determines the category of the television program currently being watched and then is able to quickly determine which channel to switch the viewer when an advertisement availability occurs during the program.

The network controller 214 can also perform the step of correlating program category watched 470 and set top terminal grouping 460 to select the target video. In order for the network controller 214 to perform this function, it must have information on the program currently being watched by the viewer. To obtain this information in a polling system, set top polling must occur on a real-time basis (i.e., 10 minutes).

During the target commercial selection process, the set top terminal programming will default to the existing commercial during a program if it is missing any of the

information needed to determine which of the continuously playing commercial channels to show. In alternative embodiments, the default that is shown on the regular programming channel will correlate with one of the assigned set top groupings and program categories. Figure 20a shows, at 478, that the default has been assigned to set top terminal grouping C for program categories "children" and "entertainment."

The three preferred methods to transmit targeted commercials to a set top terminal 220 are: (1) the Additional Bandwidth method (or individual video access); (2) the Multiple Channel method, and (3) the Split Screen method. Each method has certain advantages and disadvantages. The Additional Bandwidth method allows the most flexibility by more specifically targeting commercials before the commercials are transmitted to a set top terminal 220. However, it requires a great deal of available bandwidth in the delivery system. This is difficult with a cable system 200 but possible when a telephone or personal communications system is used to transmit the commercials to the set top terminal 220.

The Additional Bandwidth method allows the network controller 214 to run through a set top terminal's specific correlation algorithms and target specific commercials from hundreds for each set top terminal 220. This method allows for the greatest customizing of targeting and allows for a greater selection of commercials to be shown. Only after a commercial advertisement is selected by the network controller 214 for the specific set top terminal 220 does transmission of the commercial occur.

The Multiple Channel method requires a set top terminal 220 "transparently" to change channels during a

scheduled advertisement from the channel of the currently viewed program to the channel which is carrying the targeted commercial. Although this channel changing method may be transparent to the viewer, it creates difficulty in terms of timing and synchronizing the commercials to begin and end during an advertisement availability occurring in the normally scheduled program. The channel changing is done within the set top terminal 220 using the existing tuner(s) (not depicted). Alternatively, in set top terminals 220 equipped with two tuners, the terminal can use the second tuner to tune the channel showing the commercial. (Set top terminals with two tuners are described in detail in co-pending patent application, Ser. No. PCT/US93/11606, entitled, **ADVANCED SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS**. Again, the channel changing is transparent to the viewer who believes the same channel is continuously being shown. The Multiple Channel method has the disadvantage of requiring that sufficient additional channels be available (by less bandwidth than Available Bandwidth method).

The Split Screen method transmits multiple commercials on a single channel using a split screen technique; commercials being pre-recorded and prepared prior to transmitting to the set top terminal 220. Although many commercials can be transmitted on a single channel, in the preferred form of the split screen method, only four commercials are shown. As the number of commercials increases the size and the amount of video information transmitted for each commercial decreases proportionately (i.e., 6, 8, 12, etc.). Using split screen methodology, either a masking technique or a scaling and repositioning of video technique must be used at the set top terminal 220 to show

the ad. The masking and repositioning-scaling techniques are further defined in co-pending application entitled, SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, Ser. No. PCT/US93/11618, owned by the assignee of the present invention. The scaling and repositioning technique produces better quality commercials, but requires expensive equipment at the set top terminal 220. The set top terminal 220 will perform audio switching with the split screen method to amplify the correct audio.

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12. Alternatives to Basic Advertisement Targeting Routine

Figure 21 shows a software program flow 490 that is an alternative to the network controller's Basic Advertisement Targeting routine 374, depicted in Figure 17. The alternative program 490 allows each set top terminal 220 to be individually targeted with specific advertisements and is initiated automatically, block 492, by the network controller CPU 224 upon receipt of each polling response from a set top terminal 220. Thus, once the network controller 214 receives program access information from a set top terminal 220, the network controller CPU 224 begins the process of selecting a package of advertisements that is based on, among other things, that subscriber's demographic information and viewing history.

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Upon receipt of a polling response from a set top terminal 220, the network controller CPU 224 reads the set top terminal identifier, 494, and the programs accessed, 496, from the polling response (or status report) (depicted in Figure 10b). The network controller 214 writes information on the programs accessed to the Program Scheduling database 320, updating the Access History File which

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contains listings of all programs accessed within the past week, month or year.

5 With continued reference to Figure 21, the network controller CPU 224 then calls a subroutine that sorts the programs accessed by program category, block 498. In turn, the program categories are sorted, 500, based on the number of times that programs appearing in each particular category are accessed. In so doing, this sorting subroutine determines and ranks those programs and program categories that are most frequently viewed by that set top terminal 220.

10 The subroutine can iteratively produce rankings for different time slots in a given day. In this way, different rankings can accommodate different viewing preferences during those time slots for a single set top terminal 220. For example, where rankings for eight three-hour time slots are desired, the subroutine determines a ranking of programs and program categories for each three-hour viewing period. Thus, a different ranking may be produced, for instance, for a morning time slot and an evening time slot. All rankings of programs and program categories for that set top terminal 220 are written to the Viewer Profile database 314, updating the Viewer Log File, as at function block 502.

25 Next, the network controller CPU 224 calls a subroutine that correlates the updated Viewer Log File with the Advertisement Categories File in the Advertisement Library database 322, block 504. By correlating these two files with one another, the subroutine assigns or correlates various categories of television commercials to each ranking of programs and program categories in the Viewer Log File. 30 The categories of television commercials and advertisements that may be so assigned are found in the Advertisement Categories File indicated generally at 354 as part of the

library 322 and may include: (1) Household Goods/Products, (2) Home Improvement and Maintenance, (3) Personal Hygiene, (4) Entertainment Items and Events, (5) Sporting Goods and Events, (6) Motor Vehicles and Related Products, (7) Foodstuffs and Beverages, and (8) Miscellaneous. Where, for example, the viewer has watched a sporting event, the Sporting Goods and Events, Home Improvement and Maintenance, and Foodstuffs and Beverages categories may be assigned to that particular sporting event/program and Sports program category.

Once the programs and program categories ranked in the Viewer Log File are correlated with the advertisement categories in the Advertisement Categories File, the routine calls a sorting subroutine that ranks the groups of advertising categories correlated based on other information in the database files. In the preferred system, this ranking is primarily based on data in the updated Access History File and the updated Viewer Log File, as shown at function block 506. By using data on the viewer's past program selections and demographic information, the subroutine ranks the correlated categories of advertisements according to those likely to be of most interest to that viewer.

After the advertisement categories have been sorted and ranked, the routine selects the top three advertisement categories as the targeted categories for a given time slot and viewer, block 508. Individual advertisements are then chosen from the Advertisements File, with all selections made from the targeted categories, 510. The advertisements that are selected are written to the Advertisement Targeting File from where advertising packages can be generated, function 512, for transmission to the set top terminal 220. Such packages are generated by the network controller CPU

224, which accesses the Advertisement Targeting File and includes the targeted advertisements in the PCI signal. The entire routine is repeated for each set top terminal 220 and, alternatively, each viewer.

5 13. Account/Billing Routine

Figure 22 shows a software flow diagram for the network controller's Account/Billing routine 376, initiated automatically at block 520 by the network controller CPU 224 upon receipt of each polling response from a set top terminal 220. Upon receipt of such a response, the network controller CPU 224 identifies the set top terminal identifier from the polling response, block 522. The program access block in the polling response is also read, function 524, and the Access History File is updated with the received information, function 526. The routine then calls a subroutine that correlates the updated information in the Access History File with the Price Category File in the Program Library database, block 528. Once all programs accessed since the last polling cycle are assigned to a price category, the pricing information from each category is written to the Account History File, updating the file at 530. The network controller CPU 224 generates a billing report for each set top terminal 220 based on the updated account history, function 532. This billing report can be sent to the set top terminals 220 in a polling request. Specifically, in one embodiment, the information field of the frame format described in Figure 9a is used to provide the set top terminal 220 with billing information.

Account information for each set top terminal 220 can be viewed through a monthly account review menu. The account information necessary to create the monthly account review menus may be stored either in the memory of the set

top terminal 220 or at a remote location that communicates with the set top terminal 220. In the simplest embodiment, the set top terminal 220 records a subscriber's selections locally and calculates the monthly account review based upon the subscriber's selections which require the payment of fees. This monthly account information is stored locally and sent to the network controller 214 upon polling.

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The Account/Billing routine is capable of processing account and billing information generated in other embodiments. For example, in an alternate embodiment, the subscriber's viewing selections and billing information may be continuously maintained at the network controller 214 or a remote site connected via communication lines to the cable headend 208. The network controller 214 or the remote site must regularly transmit the monthly account information to the set top terminal 220.

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Each embodiment, such as local billing storage at the set top terminal 220, billing by the network controller 214 or billing by a remote site, has advantages and disadvantages. If the account information and processing is done locally at the set top terminal 220, each set top terminal 220 must be provided with the memory and necessary processing capability to maintain the account. This greatly increases the cost of a set top terminal 220. If the account information is maintained remotely, the remote site must remain in regular contact with the set top terminal 220 in order to provide the subscriber with billing information. To accommodate homes with multiple viewers two or more set top terminals 220 may be placed on a single bill or two accounts may be created for one set top terminal 220.

Figure 23 shows another embodiment in which billing may be accomplished through the use of remote statistical

and billing sites (SBS). In this arrangement, statistical and billing information from individual communities of set top terminals 1750 is communicated through cable headend sites to regional statistical and billing sites 1730 (SBS). A regional
5 SBS may serve several cable headend sites, shown at 1732. The regional SBS 1730 calculates billing and statistical information and passes necessary billing information back downstream through the network controller 214 at the cable headend 208 to an appropriate single set top terminal 220 in
10 a subscriber's home. In addition, the regional SBS 1730 communicates the billing and statistical information received on program viewer choices to the central SBS 1740.

The central SBS 1740 accumulates the data received from a number of regional statistical and billing sites and
15 calculates national statistical and billing information. In the preferred embodiment, the regional SBS 1730 prints and mails bills to subscribers. The central SBS 1740 can calculate program ratings, shares and HUTS (homes using televisions) for the nation and by region. With information from
20 interactive TV programs, sophisticated statistical information may be gathered through the network controllers of the cable headends.

This arrangement for billing and statistical information provides the operators of the system with the advantages of
25 distributive processing.

Remote billing sites may serve regions of the country by having each cable headend 208 in a region of the country connected to one regional billing site. The information from the regional billing sites may then be communicated on a less
30 frequent basis to the operations center 202 or a central billing location. This method of distributed processing of billing enables the central billing location to receive fewer

communications and be more efficient. In addition, the communication links between the cable headend's network controller 214 and regional sites will be of shorter distance than communication links to the operations center 202 from the cable headends 208. This should result in a cost savings to the system operator.

Regional statistical and billing may, however, be eliminated and all communications from the cable headend 208 may proceed to the Central SBS 1740. In fact, the Central SBS 1740 can be collocated with the operations center 202 and all functions performed at one central location. If the cable program packaging and delivery system 202 is established in just one locale, the network controller 214 can perform all the statistical and billing procedures.

The terms and descriptions used herein are set forth by way of illustration only and are not meant as limitations. Those skilled in the art will recognize that numerous variations are possible within the scope of the invention as defined in the following claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A network controller for remotely managing account and billing information over a cable television distribution network characterized by:

a means for creating a polling request message;

a means for transmitting the polling request message to set top terminals, wherein the polling request message directs each set top terminal to initiate upstream data transmission of set top terminal status reports over the cable distribution network;

a means for receiving the set top terminal status reports, wherein the set top terminal status reports include programs watched data;

a means for storing network control data, wherein the stored network control data includes programs watched data and price category data;

a means for correlating the programs watched data with the price category data to produce price correlations; and

a means for generating at least one billing report based on the produced price correlations; and

a means for transmitting the billing reports to the set top terminals for display on a television screen.

2. A method for remotely managing account and billing information over a cable television distribution network for a plurality of set top terminals, the method characterized by the steps of:

creating a polling request message;

transmitting the polling request message to the set top terminals, wherein the polling request message directs each set top terminal to initiate upstream data transmission of set top terminal status reports over the cable distribution network;

receiving the set top terminal status reports, wherein the set top terminal status reports include programs watched data;

storing network control data, wherein the stored network control data includes programs watched data and more than one price category;

correlating the programs watched data with the price categories, wherein price correlations are produced; and

generating at least one billing report based on the produced price correlations; and

transmitting the billing reports to the set top terminals for display on a television screen.

3. A network controller for use with a cable headend capable of remotely targeting categories of advertisements to groups of set top terminals in a cable television system, the network controller characterized by:

a means for gathering programs watched data for each set top terminal in the cable television system;

a means for counting the gathered programs watched data to determine the frequency of programs watched by each set top terminal in the cable television program delivery system, wherein the programs watched counts are compiled by program category and time slot;

a means for creating set top terminal group information indicating a group assignment for each set top terminal by correlating the programs watched counts with the categories of advertisements, wherein each category advertisements includes one or more advertisements available for targeting to the set top terminals; and

a means for transmitting the set top terminal group information to the set top terminal in a control information stream

that instructs the set top terminal in selecting targeted advertisements for display during viewing of programs.

4. A network controller for remotely monitoring a plurality of set top terminals in a cable television system, the network controller characterized by:

a means for receiving a program control information signal from digital signal processing equipment, wherein the digital signal processing equipment is co-located with the receiving means at the cable headend and the program control information signal is received by the digital signal processing equipment from a remotely located source;

a means for storing network control data, wherein the stored network control data includes data on television programs;

a means for accessing the stored network control data;

a means for generating a control information stream using the received program control information signal and the accessed network control data, wherein the received program information signal carries data on packaged programs or menu content and whereby information fields of the control information stream are created by modifying the data on packaged programs or menu content based on the stored network control data so that the created information fields contain data on modified packages of programs or modified menu content, including program category and menu assignment information;

a means for transferring the control information stream to the digital signal processing equipment, whereby the control information stream is subsequently distributed by the digital signal processing equipment to multiple set top terminals;

a means for gathering programs watched data for each set top terminal in the cable television program delivery system,

wherein the gathered programs watched data is stored in the storing means so that it can be accessed by the accessing means;

a means for counting the accessed programs watched data to determine the frequency of programs watched by each set top terminal in the cable television program delivery system, wherein the programs watched counts are arranged in at least one programs watched matrix by program category and time slot; and

a means, connected to the generating means, for creating set top terminal group information indicating a group assignment for each set top terminal by correlating the programs watched counts with the categories of advertisements, wherein each advertisements category includes advertisements available for targeting to the set top terminals, and wherein the created set top terminal group information is included as data in the control information stream.

5. The network controller of claim 4, characterized in that the gathering means includes:

a means for generating a polling request message that directs each set top terminal to initiate transmission of set top terminal status reports;

a means for receiving the set top terminal status reports, wherein the received set top terminal status reports contain programs watched information;

a means for processing the received set top terminal status reports to produce polling response data; and

a means for temporarily storing the polling response data.

6. The network controller of claim 5, characterized in that the processing means includes:

a means for demodulating the received set top terminal status reports, whereby demodulated set top data is produced;

a means for reading at least one information field in the demodulated set top data, wherein each information field is appended to a set top terminal identification number field;

a means for sorting each information field in the received set top terminal status reports by set top terminal identification number; and

a temporary memory means for accumulating the sorted information fields for each set top terminal, wherein the accumulated sorted information fields produce the polling response data.

7. The network controller of claim 5 further characterized by a means for updating the programs watched data in the storing means with the polling response data.

8. The network controller of claim 5, characterized in that the counting means includes:

a means for reading the programs watched counts, wherein a separate programs watched counts is assigned to different time slots in a day for each program category;

a means for sorting the programs watched counts from highest to lowest;

a means for matching the sorted programs watched counts with the advertisements categories, wherein counts of the advertisements categories are thereby produced.

9. A network controller for remotely monitoring a plurality of set top terminals in a cable television system, the network controller characterized by:

a means for receiving a program control information signal from digital signal processing equipment, wherein the digital signal processing equipment is co-located with the receiving means

at the cable headend and the program control information signal is received by the digital signal processing equipment from a remotely located source;

a means for storing network control data, wherein the stored network control data includes data on television programs;

a means for accessing the stored network control data;

a means for generating a control information stream using the received program control information signal and the accessed network control data, wherein the received program information signal carries data on packaged programs or menu content and whereby information fields of the control information stream are created by modifying the data on packaged programs or menu content based on the stored network control data so that the created information fields contain data on modified packages of programs or modified menu content, including program category and menu assignment information;

a means for transferring the control information stream to the digital signal processing equipment, whereby the control information stream is subsequently distributed by the digital signal processing equipment to multiple set top terminals;

a means for gathering programs watched information from groups of the set top terminals;

a means for storing the gathered programs watched information and the individual advertisements arranged by advertisement category;

a means for sorting the stored programs watched information by a plurality of program categories;

a means for ranking the plurality of program categories by frequency of programs watched in each category, wherein program categories with more programs watched are ranked higher than program categories with less programs watched;

a means for ranking the stored advertisement categories, wherein the ranked program categories are correlated with the stored advertisement categories;

a means for selecting a set of highest ranked advertisement categories;

a means for choosing individual advertisements from the set of highest ranked advertisement categories; and

a means, connected to the generating means, for packaging the chosen individual advertisements for transmission to the set top terminals for display, wherein packages of targeted advertisements are produced and included in the control information stream and sent to the transferring means.

10. The network controller of claim 9, characterized in that the gathering means includes:

a means for receiving polling responses from the set top terminals, wherein the polling responses are transmitted upstream over the cable distribution network in response to a polling request message that is sent to the set top terminals in the control information stream generated by the generating means; and

a means for processing the received polling responses, wherein data on the programs watched information for the set top terminals is extracted.

11. The network controller of claim 10, characterized in that the gathering means further includes a means for updating previously stored programs watched information in the storing means using the extracted data.

12. A network controller for remotely monitoring a plurality of set top terminals in a cable television system, the network controller characterized by:

a means for receiving a program control information signal from digital signal processing equipment, wherein the digital signal processing equipment is co-located with the receiving means at the cable headend and the program control information signal is received by the digital signal processing equipment from a remotely located source;

a means for storing network control data, wherein the stored network control data includes data on television programs;

a means for accessing the stored network control data;

a means for generating a control information stream using the received program control information signal and the accessed network control data, wherein the received program information signal carries data on packaged programs or menu content and whereby information fields of the control information stream are created by modifying the data on packaged programs or menu content based on the stored network control data so that the created information fields contain data on modified packages of programs or modified menu content, including program category and menu assignment information;

a means for transferring the control information stream to the digital signal processing equipment, whereby the control information stream is subsequently distributed by the digital signal processing equipment to multiple set top terminals;

a means for receiving set top terminal status reports, wherein the set top terminal status reports are transmitted by the set top terminals upstream over the cable distribution network in response to a polling request message that is sent to the set top terminals in the control information stream generated by the generating means and wherein the received set top terminal status reports include programs watched data that is stored in the storing means for use by the generating means in generating the control information stream;

a means, connected to the accessing means, for correlating the programs watched data with price category data stored in the storing means to produce price correlations; and

a means for generating at least one billing report based on the produced price correlations, wherein the billing reports are included in the control information stream and sent to the transferring means for subsequent distribution to the set top terminals.

13. An apparatus for targeting advertising to at least one subscriber, comprising by:

means for gathering programs watched data from a subscriber;

and

a processor operably connected to the gathering means and including:

means for analyzing the gathered programs watched data by determining the frequency of programs watched by the subscriber or the viewing habits of the subscriber;

means for correlating the analyzed programs watched data with at least one advertisement by comparing the programs watched data with advertisements;

means for selecting at least one correlated advertisement.

14. The apparatus of claim 13 further including a display for displaying the selected advertisement.

15. The apparatus of claim 13 further including a display for displaying a menu listing the selected advertisement.

16. The apparatus of claim 13, 14 or 15, further including a receiver operably connected to the processor for receiving television signals.

17. The apparatus of any one of claims 13 to 16, wherein the gathering means and processor are located in a set top terminal.
18. The apparatus of claim 17, wherein the set top terminal includes a memory for storing video corresponding to the selected advertisement.
19. The apparatus of claim 13 further including a receiver, wherein the receiver receives several channels of advertisements.
20. The apparatus of claim 19 further including:
means for selecting one of the channels of advertisements; means for switching to the selected channel; and a display, wherein switching to the selected channel is transparent to the viewer.
21. The apparatus of claim 19, wherein the receiver also receives directions which instruct a set top terminal to video corresponding to the selected advertisement, and further including a memory for storing the video corresponding to the selected advertisement.
22. The apparatus of claim 13, wherein the gathering means and processor are located in a cable headend, a network controller or an operations center.
23. The apparatus of claim 22 further including a transmitter for transmitting the selected advertisement.
24. The apparatus of claim 13, wherein the analyzing means creates a viewer file.
25. The apparatus of claim 24, wherein the frequency of programs watched by the subscriber is arranged in at least one programs watched matrix.

26. The apparatus of claim 25, wherein the programs watched matrix is arranged by program category and time slot and the analyzing means includes:

means for reading the programs watched matrix; and

means for sorting programs watched counts within a time slot from highest to lowest.

27. The apparatus of any one of claims 13 to 26, wherein the correlated advertisement is a category of advertisements and the category of advertisements includes at least one advertisement.

28. The apparatus of claim 27, wherein the category of advertisements includes at least one promotion or at least one infomercial.

29. The apparatus of any one of claims 13 to 28, wherein the correlated advertisement is an infomercial or a promotion.

30. The apparatus of any one of claims 13 to 29, wherein the gathering means gathers programs watched data from a plurality of subscribers and the processor processes the programs watched data gathered from the plurality of subscribers.

31. The apparatus of any one of claims 13 to 30 further including:

means for developing a program line-up based on the analyzed programs watched data, wherein the program line-up includes advertisements; and

means operably connected to the developing means for transmitting the program line-up to the subscriber.

32. The apparatus of claim 31 further including means for gathering marketing data, wherein the analyzing means also analyses the marketing data.

**33. The apparatus of any one of claims 13 to 32 further including:
a memory operably connected to the processor for storing at least one program for selection; and
means operably connected to the memory for choosing at least one stored program based on the analyzed data.**

34. The apparatus of claim 33 further including means operably connected to the choosing means for displaying the chosen program to the subscriber.

35. The apparatus of claim 13, wherein the processor includes a first and a second processor, the first processor including the analyzing means, and the second processor including the correlating means and the selecting means.

36. The apparatus of claim 13, wherein the processor includes a first and second processor, the first processor including the analyzing means and the correlating means, and the second processor including the selecting means.

37. The apparatus of claim 35 or 36, wherein the first processor is in a network controller or in an operation center and the second processor is in a set top terminal.

38. The apparatus of claim 13, wherein the processor polls at least one set top terminal to monitor programs being watched by the subscriber for the occurrence of commercial breaks, further including:

means for polling at least one set top terminal; wherein the transmitter transmits at least one selected advertisement in response to the occurrence of commercial breaks determined by the polling means.

39. The apparatus of claim 13, wherein the gathering means is a set top terminal comprising a memory and the memory stores programs watched data, and the processor further includes means for accessing the stored programs watched data from the set top terminal.

40. The apparatus of claim 39, wherein the processor polls the set top terminal for status reports, the accessing means accesses the status reports sent by the set top terminal, and the accessing means further includes:

means for generating a polling request message that directs the set top terminal to initiate transmission of status reports containing programs watched information;

means for status report processing, wherein the status reports are processed to produce polling response data; and

means for temporarily storing the polling response data.

41. The apparatus of claim 40, wherein the means for report processing includes:

means for demodulating the status reports, whereby a demodulated set top data is produced;

means for reading at least one information field in the demodulated set top data, wherein each information field is appended to a set top terminal identification number field;

means for sorting each information field in the status reports by a set top terminal identification number; and

temporary memory means, wherein each sorted information field is accumulated and each accumulated sorted information field produces the polling response data.

- 42. The apparatus of claim 40 further including:
means for storing the programs watched data; and
means for updating the programs watched data in the storing
means with the polling response data.**
- 43. The apparatus of claim 13 further including means for gathering
demographic data from subscribers, wherein the means for correlating
also uses the gathered demographic data.**
- 44. The apparatus of claim 43, wherein a first group of subscribers
forms a statistically significant number of subscribers, the means for
gathering demographic data gathers demographic data from the first
group of subscribers, the means for gathering programs watched data
gathers programs watched data from the first group of subscribers and a
second group of subscribers, and the apparatus further includes means
for generating a simulated demographic profile of the second group of
subscribers by comparing the programs watched data of the second group
of subscribers with the gathered demographic data and the programs
watched data of the first group of subscribers.**
- 45. The apparatus of claim 13, wherein the processor further includes:
means for counting the gathered programs watched data to
determine the frequency of programs watched by the subscribers,
wherein the programs watched counts are arranged in at least one
programs watched matrix by program category and time slot; and
means for creating subscriber group information indicating a
group assignment for each subscriber by correlating the programs
watched counts with at least one advertisement; and
wherein the transmitter transmits the subscriber group
information in a control information stream.**

46. The apparatus of claim 45 further including a set top terminal, wherein the control information stream instructs the set top terminal in selecting advertisements for display during viewing of programs.

47. The apparatus of any one of claims 13 to 46, wherein at least one advertisement is a promotion or an infomercial.

48. The apparatus of any one of claims 13 to 47, wherein at least one advertisement includes information on advertisements but not video corresponding to the information on advertisement.

49. The apparatus of any one of claims 13 to 48, wherein at least one advertisement includes information on advertisements and video corresponding to the information on advertisements.

50. The apparatus of claim 49, wherein the information on advertisements identifies an infomercial or a promotion.

51. The apparatus of claim 50, wherein the information on advertisements identifies the individual advertisements by name or type of advertisement.

52. The apparatus of claim 49, wherein the information on advertisements includes directions for inserting advertisements into a program line-up.

53. A method of targeting advertisements, comprising:
gathering programs watched data from a subscriber;
analyzing gathered programs watched data by determining the frequency of programs watched by the subscriber or the viewing habits of the subscriber;

correlating the analysed programs watched data with at least one advertisement by comparing the programs watched data with advertisements; and

selecting an advertisement based on programs watched data.

54. The method of claim 53 further including the step of transmitting the selected advertisement for display to the subscriber.

55. The method of claim 53 or 54 further including the step of storing the selected advertisement.

56. The method of any one of claims 53 to 55, wherein the gathered programs watched data is analysed to determine a viewer profile for the subscriber.

57. The method of any one of claims 53 to 56, wherein the advertisement is a promotion or an infomercial.

58. The method of any one of claims 53 to 57, wherein the advertisement is information on advertisements, but no video corresponding to the information on advertisements.

59. The method of any one of claims 53 to 57, wherein the advertisement is information on advertisements and video corresponding to the information on advertisements.

60. The method of any one of claims 53 to 59, wherein the advertisement is a category of advertisements, and the category of advertisements includes at least one advertisement.

61. The method of claim 60, wherein the category of advertisements includes at least one promotion or at least one infomercial.

62. The method of any one of claims 53 to 61 further including the steps of:

**receiving several channels of advertisements;
wherein the selected advertisement is within a received channel;
and switching to the channel containing the selected advertisement.**

63. The method of claim 62, wherein the step of switching is transparent to the viewer.

64. The method of any one of claims 53 to 63 further including the steps of:

**storing at least one program for selection at a remote location;
choosing at least one stored program based on the analyzed data;
and transmitting at least one chosen program from the remote location to the subscriber.**

65. An apparatus for providing digital program signals to subscriber locations, capable of inserting local availability signals and selecting digital program signals received from outside sources, comprising:

a means for receiving digital program signals;

digital logic circuitry, connected to the receiving means, wherein digital program signals may be inserted and wherein digital programs may be selected;

a processor, operably connected to the digital logic circuitry, wherein insertion of local availability signals are controlled and wherein the selection of digital program signals are controlled; and

means for sending programs, operably connected to the digital logic circuitry, wherein digital program signals are sent to

subscriber locations, and wherein digital program signals that have been inserted or selected are sent to subscriber locations.

66. The apparatus of claim 65 wherein the digital logic circuitry comprises a combiner, wherein digital program signals are combined.

67. The apparatus of claim 65 wherein the digital logic circuitry comprises a local inserter, wherein local availability signals are inserted to be sent to subscriber locations.

68. The apparatus of claim 65 wherein the sending means comprises a serializer wherein the serializer serializes digital program signals.

69. The apparatus of claim 65 wherein the receiving means comprises an integrated receiver decoder.

70. An apparatus for use in a program delivery system having a plurality of program signals, wherein the apparatus receives directions for local insertion from a remote source, comprising:

a receiver, wherein directions for local insertion from a remote source are received;

a database, containing information on a plurality of programs;

a processor, operably connected to the receiver and database, wherein the directions from the remote source are processed to generate a processed signal;

a local inserter, connected to the processor, wherein local programming is inserted into a digital program signal using the processed signal from the processor; and

a modulator, wherein a plurality of program signals including the program signal carrying the inserted local programming is modulated.

71. The apparatus of claim 90 further comprising a signal processor, operably connected to the modulator, wherein the signal processor receives a plurality of program signals from the remote source.

72. The apparatus of claim 90 wherein the receiver receives selecting directions on a subset of programs from the plurality of programs to be selected from a remote source, the processor processes the selecting directions, and wherein the local inserter comprises:

digital logic, wherein the digital logic selects programs using the processed directions, and wherein the modulator modulates the selected programs.

73. The apparatus of claim 90 wherein the local programming is advertising and the directions for local insertion are directions for inserting advertisements.

74. An apparatus for a program signal delivery system wherein digital program signals are used comprising:

a receiver, wherein program signals are received;

a demultiplexor, connected to the receiver, wherein program signals are demultiplexed for processing;

digital logic, connected to the demultiplexor, wherein demultiplexed signals are processed;

a control processing unit, operably connected to the digital logic, wherein the processing of the demultiplexed signals in the digital logic is controlled;

multiplexor, connected to the digital logic, wherein processed signals are multiplexed; and

a modulator, connected to the multiplexor, wherein multiplexed signals are modulated and wherein the modulated signal is forwarded to subscribers.

75. The apparatus of claim 74 wherein the processing of signals includes local insertion of program signals.

76. The apparatus of claim 74 wherein the processing of signals includes selection of certain demultiplexed signals.

77. An apparatus for use with a network having subscribers that uses two-way communications allowing upstream data transmission from the subscriber comprising:

a two-way communication system comprising

one or more diplex filters, wherein the diplex filters facilitate upstream data transmissions;

a signal processor, operably connected to the two-way communication system, wherein signals are processed before being sent downstream to subscribers;

an RF combiner, connected to the two-way communication system, wherein upstream data transmissions are received from the two-way communication system;

a network controller, connected to the RF combiner, wherein upstream data transmissions are received from the RF combiner; and

wherein program control information is used, and the network controller comprises a processing unit, wherein program control information is processed.

78. The apparatus of claim 77 wherein the network controller comprises memory and a processing unit, wherein programs watched information received from the RF combiner is processed by the processing unit and stored in the memory.

79. The apparatus of claim 77 herein the network controller comprises:

a memory, wherein an interactive game program is stored;
and
a processor, operably connected to the memory, wherein
the processor executes an interactive game program.

80. A computer system for a network which controls video and audio delivery to subscriber locations, comprising:

a network connecting subscriber locations;
a plurality of terminals, connected to the network, to allow subscribers at subscriber locations to access the network;
a processor, connected to the network and remotely located from the subscriber locations, wherein the processor generates control signals to control the distribution of video and audio signals to the plurality of terminals located at subscriber locations;
and
signal processing equipment, which communicates with the processor through a non-network connection, adapted to output audio and video signals to a plurality of terminals.

81. The computer system of claim 80 wherein subscribers interact with other subscribers on the network and the processor processes subscriber requests to interact with other subscribers.

82. The computer system of claim 81 wherein the means to allow subscribers to interact with other subscribers comprises an interactive game, wherein more than one subscriber plays the same game.

83. The computer system of claim 80 further comprising a receiver, operably connected to the processor, wherein the digital video and audio signals are television programs received via satellite transmission by the receiver.

84. A network controller for use in a cable system for choosing text overlays, wherein a subscriber may request a text overlay representing the audio associated with the video to a program, wherein a set top terminal transmits the subscriber requests comprising:

a means for receiving subscriber requests;

a processor to identify the subscriber request for text overlays from a plurality of subscriber requests;

a means for choosing the corresponding text overlay from a plurality of text overlays; and

a means for transmitting text overlay to the set top terminal for display.

85. The network controller of claim 84 further comprising:

means for receiving control signals with text overlay;

means for processing the received control signals for text overlay.

86. The network controller of claim 84 wherein programs may have sign language video associated with the program wherein the sign language video is displayed.

87. The network controller of claim 86 wherein the sign language video is transmitted on a separate channel to the subscriber.

88. A system for choosing audio channels, wherein more than one audio channel may exist for a video, comprising:

a signal processor, wherein a plurality of digital video signals and audio channels are received, and wherein a received video signal may have multiple audio channels;

a controller, wherein the controller selects one or more received audio channels, wherein one or more audio channels that correspond to a received video are selected;

a distribution system, operably connected to the controller, wherein the selected audio channels are distributed and a listener receives one or more audio channels; and

wherein a program control information signal is used by the controller to select one or more received audio channels.

89. The system of claim 88 wherein the program control information signal is received by the signal processor, further comprising an interface connecting the signal processor and the controller, wherein the program control information signal is passed between the signal processor and controller using the interface.

90. The system of claim 88 wherein each audio channel received by the signal processor for a particular video is in a different language and the controller selects audio channels based on language desired.

91. An apparatus that gathers information related to television viewing habits, comprising:

a first processor that provides information related to which television programming was viewed;

a first memory coupled to the first processor that stores the information;

a second processor that receives the information from the first memory and arranges the information as programs watched data; and

a second memory coupled to the second processor that stores the programs watched data.

92. The apparatus of claim 91, wherein the information includes date and time information, and program information and wherein the programs watched data is stored as a programs watched matrix.

93. The apparatus of claim 92, wherein the program information includes one or more of program category, program title information, and program duration.

94. The apparatus of claim 93, wherein the program category includes one or more of sports, movies, children's shows, news shows and pay-for-view events, and wherein the date and time information is the date and time the program was viewed.

95. The apparatus of claim 93 or 94, wherein the programs watched matrix includes columns and rows, the columns listing the time and date information and the rows listing the program information.

96. The apparatus of claim 95, wherein the time and date information is listed in blocks of four hours.

97. The apparatus of any one of claims 91 to 96, wherein the information is provided from a plurality of set top terminals that receive programming from a television delivery system, and wherein each of the plurality of set top terminals is identified by a unique identification number.

98. The apparatus of claim 97, wherein each particular set top terminal has an associated programs watched matrix, and programs watched data for a particular set top terminal is arranged in the associated programs watched matrix.

99. The apparatus of claim 98, wherein as additional television programming is viewed, the programs watched matrix for the set top terminal is updated.

100. The apparatus of any one of claims 91 to 99, wherein the first processor and the first memory are contained in a set top terminal.

101. The apparatus of any one of claims 91 to 100, wherein the second processor and the second memory are contained in a cable television headend.

102. The apparatus of any one of claims 91 to 101, wherein the second processor and the second memory are contained in an operations center.

103. The apparatus of any one of claims 91 to 102, wherein the second processor and the second memory are contained in a set top terminal.

104. The apparatus of any one of claims 91 to 103, wherein the second processor obtains the information by sending a polling message to a set top terminal connected to the second processor, the set top terminal, in response to the polling message, sending the information to the second processor.

105. An apparatus that gathers programs watched data, comprising:
a plurality of terminals connected to corresponding televisions and to a television program delivery system, each of the terminals including a memory that stores program access information; and
a receiver coupled to the plurality of terminals, the receiver receiving the program access information, wherein the program access information is stored as programs watched data.

106. The apparatus of claim 105, wherein the programs watched data is stored in a programs watched matrix, each of the terminals being assigned a unique programs watched matrix.

107. The apparatus of claim 106, wherein each of the terminals is assigned a unique address used to identify the terminal and the associated programs watched matrix.

108. The apparatus of claim 106 or 107, wherein each of the terminals is assigned a group identification, the group identification common to at least two terminals.

109. The apparatus of claim 106, 107 or 108, wherein the programs watched matrix includes time of day a program is watched and a program category for the program.

110. The apparatus of claim 109, wherein the program categories include one or more of children's programs, news programs, sports programs, pay-for-view, and movies.

111. The apparatus of any one of claims 106 to 110, wherein the programs watched matrix includes a time of day a program is watched and a program title.

112. The apparatus of any one of claims 106 to 111, wherein the unique programs watched matrix is updated as additional program access information is provided by the associated terminal.

113. The apparatus of claim 112, wherein the programs watched data is recorded as counts, the counts corresponding to the number of times a program category is watched at the associated terminal.

114. The apparatus of any one of claims 105 to 113, further comprising a plurality of databases, wherein each of the plurality of databases receives information from programs watched matrices, the information including the terminal address, group identifier, and program counts, the

databases including one or more of viewer profile, account billing, program scheduling and advertisement scheduling databases.

115. The apparatus of any one of claims 105 to 114, further comprising a controller in the television program delivery system, the controller coupled to the plurality of terminals, the controller issuing a message directing each of the terminals to provide the program access information, wherein the message is a polling request message, the polling request message sent over one of a cable television cable and a telephone line and a response message is returned over one of the cable television cable and the telephone line.

116. The apparatus of claim 115, wherein the polling request message is a cyclic polling message, and wherein the cyclic polling message is one of roll-call polling, hub polling and token-passing polling.

117. The apparatus of any one of claims 115 or 116, wherein the program access information is provided in the response message, the response message including:

- a leading flag;
- an address field including the address of the terminal;
- a subscriber region designation that includes a geographical region in which the terminal is located;
- a terminal identifier that uniquely identifies the terminal;
- an information field that includes a command to provide the program access information; and
- a trailing flag.

118. The apparatus of claim 115, 116 or 117, wherein the plurality of terminals provide the program access information using a random access method.

119. The apparatus of any one of claims 115 to 118, wherein the controller is located in a cable headend of the television program delivery system.

120. The apparatus of any one of claims 115 to 119, wherein the controller is located in an operations center of the television program delivery system.

121. The apparatus of any one of claims 105 to 120, wherein individual terminals are grouped in one of a plurality of terminal groups, and wherein the programs watched data is stored as group programs watched data.

122. A system that gathers programs watched data in a broadcast television delivery system, comprising:

means for gathering programs watched data from one or more set top terminals in a broadcast television delivery system;

a databases that stores the gathered programs watched data;

means for accessing the stored programs watched data;

means for counting the accessed programs watched data to determine programs watched counts corresponding to the frequency of programs watched by the one or more set top terminals in the broadcast television delivery system, wherein the programs watched counts are arranged in at least one programs watched matrix;

means for creating set top terminal group information indicating a group assignment for a set top terminal by correlating the programs watched counts with categories of videos, wherein the video categories include videos available for sending to the set top terminal; and

means for transmitting the set top terminal group information to the set top terminal in a control information stream that instructs the set top terminal in selecting the videos for display.

123. The system of claim 122, further comprising:

means for extracting data from an information field of a program control information signal, wherein the extracted data includes program information;

means for creating a polling request message that directs a set top terminal to initiate transmission of a set top terminal status reports;

means for processing the received set top terminal status reports to produce polling response data; and

means for integrating the polling response data with the extracted data from the information field of the program control information signal.

124. The system of claim 123, wherein the creating means comprises:

means for reading database files using the access means, wherein the database files are relationally keyed to one another through a set of set top terminal identification numbers individually unique to a particular set top terminal;

means for formatting the polling request message, wherein the formatted polling request message includes at least one set top terminal identification number; and

means for enabling at least one polling command bit in the formatted polling request message, wherein the enabled polling command bit commands transmission of the set top terminal status reports.

125. The system of claim 123 or 124, wherein the processing means comprises:

control receiving means for demodulating the received set top terminal status reports;

means for reading at least one information field in the received set top terminal status reports, wherein the information field includes the programs watched data;

means for sorting the information fields in the received set top terminal status reports by a set top terminal identification number; and
temporary memory means for accumulating the sorted information fields for the set top terminals, wherein the accumulated sorted information fields produce the polling response data.

126. The system of claim 125, further comprising connection means for linking the processing means to the database, wherein the polling response data may be stored in the database, updating the programs watched matrix.

127. The system of claim 125 or 126, wherein the control receiving means comprises a Radio Frequency demodulator for receiving upstream data transmissions from the set top terminals.

128. The system of claim 125, 126 or 127, wherein the control receiving means comprises a telephone for receiving data transmissions from the set top terminals over telephone lines.

129. An apparatus for use in a cable television program delivery system, the cable television delivery system coupled to one or more set top terminals, the one or more set top terminals capable of generating programs watched data, the apparatus comprising:

means for gathering programs watched data for a set top terminal;

means for storing the gathered programs watched data in at least one database;

means for accessing the stored programs watched data; and

means for counting the accessed programs watched data to determine the frequency of programs watched by the top terminal, wherein the programs watched counts are arranged by program category and time.

130. The apparatus of claim 129, further comprising:

means for creating set top terminal group information indicating a group assignment for the set top terminals; and

means for transmitting the set top terminal group information to the set top terminals in a control information stream capable of polling the set top terminals, and wherein the gathering means comprises:

means for generating a polling request message that directs the set top terminals to initiate transmission of a set top terminal status report;

means for receiving the set top terminal status report, wherein the received set top terminal status report contains programs watched information;

means for processing the received set top terminal status reports to produce polling response data; and

means for storing the polling response data.

131. The apparatus of claim 130, wherein the processing means comprises:

means for demodulating the received set top terminal status report;

means for reading at least one information field in the demodulated set top data, wherein the at least one information field is appended to a set top terminal identification number field;

means for sorting the at least one information field in received set top terminal status reports by set top terminal identification number; and

memory means for accumulating the sorted information fields for the at least one set top terminal, wherein the accumulated sorted information fields produce the polling response data.

132. The apparatus of claim 130 or 131, further comprising means for updating the programs watched data in the storing means with the polling response data, and wherein the counting means comprises:

means for reading the programs watched counts, wherein a separate programs watched count is assigned to different time slots in a day for a program category; and

means for sorting the programs watched counts from highest to lowest.

133. An apparatus that gathers programs watched information from set top terminals in a broadcast television program delivery system, comprising:

means for gathering the programs watched information;

means for storing the gathered programs watched information;

means for sorting the stored programs watched information by a plurality of program categories; and

means for ranking the plurality of program categories by frequency of programs watched in each category, wherein program categories with more programs watched are ranked higher than program categories with fewer programs watched.

134. The apparatus of claim 133, wherein the set top terminals have the capability of receiving polling request messages and transmitting polling responses, the polling responses including the programs watched information, and wherein the gathering means comprises:

means for generating the polling request messages, wherein the polling request messages are transmitted to the set top terminals, requesting the set top terminals to return the polling responses;

a receiver that receives the polling responses from the set top terminals; and

means for processing the received polling responses, wherein data on the programs watched information for the set top terminals is extracted and stored.

135. The apparatus of claim 133 or 134, wherein the gathered programs watched information has been previously stored in the storing means, and wherein the gathering means comprises means for updating the programs watched information in the storing means using the extracted data.

136. The apparatus of claim 133, 134 or 135, wherein the set top terminals transmit the programs watched information using CSMA/CD protocols.

137. The apparatus of any one of claims 133 to 136, wherein the programs watched information is transmitted over a cable television cable.

138. The apparatus of any one of claims 133 to 137, wherein the programs watched information is transmitted over a telephone line.

139. A method for gathering programs watched information, comprising:

gathering programs watched data for set top terminals in a broadcast television program delivery system;

storing the gathered programs watched data in a database;

accessing the stored programs watched data; and

counting the accessed programs watched data to determine the frequency of programs watched by the set top terminals, wherein programs watched counts are arranged in a programs watched matrix.

140. The method of claim 139, wherein the set top terminals transmit set top terminal status reports in response to a polling request message produced using a program control information signal, further comprising:

creating the polling request message;

transmitting the polling request message to the set top terminals, wherein the polling request message directs set top terminals to initiate upstream data transmission of the set top terminal status reports over a cable distribution network; and

receiving the set top terminal status reports, wherein the set top terminal status reports include the programs watched data.

141. A processor in a cable television program delivery system, the delivery system providing programming to subscriber terminals, comprising:

means for gathering programs watched data for the terminals;

a database that stores the gathered programs watched data;

means for accessing the stored programs watched data; and

means for counting the accessed programs watched data to determine the frequency of programs watched at the terminals, wherein programs watched counts are arranged in a programs watched matrix.

142. The processor of claim 141, further comprising:

means for creating terminal group information indicating group assignments for the terminals by correlating the programs watched counts with categories of data, wherein the data categories include demographic data, and wherein the data categories are available for providing programming to the terminals; and

means for transmitting the terminal group information to the terminals in a control information stream that instructs the terminals in selecting the programming, wherein the processor polls the terminals to direct the terminals to provide the programs watched data.

143. The processor of claim 142, wherein the gathering means comprises:

means for generating a polling request message that directs the terminals to initiate transmission of terminal status reports;

a receiver that receives the terminal status reports, wherein the received set terminal status reports contain programs watched information;

means for processing the received terminal status reports to produce polling response data; and

a memory that stores the polling response data.

144. The processor of claim 143, wherein the processing means comprises:

a demodulator that demodulates the received terminal status reports;

means for reading information fields in the demodulated terminal data, wherein the information fields are appended to terminal identification number fields;

means for sorting the information fields in the received terminal status reports by terminal identification number; and

a temporary memory that accumulates the sorted information fields for the terminals, wherein the accumulated sorted information fields produce the polling response data.

145. The processor of claim 143 or 144, further comprising means for updating the programs watched data in the database with the polling response data.

146. The processor of claim 143, 144 or 145, wherein the counting means comprises:

means for reading the programs watched counts, wherein a separate programs watched count is assigned to different time slots in a day for each program category;

means for sorting the programs watched counts from highest to lowest; and

means for matching the sorted programs watched counts with the programs categories, wherein counts of the programs categories are thereby produced.

147. The processor of claim 146, further comprising:

means for sorting the stored programs watched information by a plurality of program categories;

means for ranking the plurality of program categories by frequency of programs watched in each category, wherein program categories with more programs watched are ranked higher than program categories with less programs watched;

means for selecting a set of highest ranked targeted program categories;

means for choosing individual programs from the set of highest ranked programs categories;

means for packaging the chosen individual programs for transmission to the terminals for display, wherein packages of programs are produced; and

means for transmitting the packages of programs to the terminals over the cable television delivery system.

148. The processor of claim 147, wherein the terminals have the capability of receiving polling request messages and transmitting polling responses upstream over one of a cable television a cable distribution network in the cable television program delivery system and a telephone line, the polling responses including the programs watched information.

149. A method for accumulating data in a cable television delivery system from a plurality of set top terminals in a cable television delivery system, comprising:

gathering programs watched data for the set top terminals;

storing the gathered programs watched data in a database;

accessing the stored programs watched data;

counting the accessed programs watched data to determine a frequency of programs watched at the set top terminals, wherein programs watched counts are arranged in a programs watched matrix.

150. A method of gathering programs watched information from a set top terminal that acquires programs from a programming source, comprising:

receiving a plurality of programs at the set top terminal;

selecting a program at the set top terminal from the plurality of programs;

monitoring the program selected at the set top terminal;

generating programs watched information relating to the selected program; and

storing the generated programs watched information.

151. The method of claim 150, wherein the steps of monitoring, generating, and storing occur in a card that receives signals from the set top terminal, and wherein the method further comprises the step of transferring signals from the set top terminal to the card.

152. The method of claim 150 or 151, wherein the steps of monitoring, generating and storing occur in a network controller coupled to the set top terminals, and wherein the method further comprises the step of transferring signals from the set top terminal to the network controller.

153. The method of claim 152, wherein the network controller is located at a cable television headend.

154. The method of claim 152 or 153, wherein the network controller is located at an operations center.

155. The method of claim 152, 153 or 154, further comprising:
accessing the stored programs watched data; and
arranging the accessed programs watched data in at least one programs watched matrix, wherein one of the at least one programs watched matrices includes time slots and program categories.
156. A television system that receives and stores data related to television viewing habits at a set top terminal, comprising;
a receiver operably connected to the set top terminal, the receiver receiving programs watched information from the set top terminal;
a processor coupled to the receiver, the processor processing the programs watched information to generate a programs watched matrix;
and
a database coupled to the processor that stores the programs watched matrix, wherein the processor is capable of intelligent selection of programs to be sent to the set top terminal.
157. The system of claim 156, wherein the received and stored data includes demographic data.
158. The system of claim 156 or 157, wherein the programs watched information is maintained in programs watched matrix by time and program category such that a most frequently watched program category can be determined for a given time.
159. The system of claim 158, further comprising a database program, wherein programs are stored for intelligent selection based on program category.
160. The system of claim 159, wherein the program database includes an advertisement database, wherein the programs include advertisements, and wherein the advertisements are stored in the

advertisement database for intelligent selection based on program category.

161. The system of claim 159, wherein the database includes a television program database, and wherein the programs include the television programs stored in television program database for intelligent selection based on program categories.

162. The system of any one of claims 159 to 161, wherein programs watched information is maintained for groups of set top terminals, the groups including one or more set top terminals so that a most frequently watched program category can be determined for a given time slot for the groups, and wherein the programs watched information is maintained in a program watched matrix by time and program category.

163. The system of claim 157, wherein the processor accesses the demographic data that is provided by the set top terminal, stores the accessed demographic data in a viewer profile database, and weights the demographic data for the set top terminal, wherein the weights may be used in producing the determined program category.

164. The system of claim 157, wherein the processor accesses group demographic data that is maintained for a group of set top terminals, the groups including one or more set top terminals, wherein the group demographic data is maintained in a group profile database, and wherein the controller weights the group demographic data, the weights being used in producing the determined program category.

165. A system for providing programming in a telecommunications network, comprising:

a terminal that gathers program data from a subscriber;

a first processor, operably connected to the terminal, the first processor analyzing the gathered program data to determine the frequency of programs watched by the subscriber and correlating the analyzed program data with categories of programs, wherein each program category includes at least one program;

a second processor that selects a program from the correlated program categories; and

a transmitter coupled to the second processor and the terminal, the transmitter transmitting the selected program to the terminal.

166. The system of claim 165, further comprising a display that displays the transmitted program.

167. The system of claim 166, wherein the display displays a menu of the selected programs from which a subscriber chooses a program to watch.

168. The system of any one of claims 165 to 167, wherein the terminal and the first processor are located in the set top box coupled to a television.

169. The system of any one of claims 165 to 168, wherein the terminal and the first processor are located at a site remote from the set top terminal.

170. The system of claim 169, wherein the site is a cable television headend, and wherein the telecommunications network is a cable television program delivery system.

171. The system of claim 169, wherein the site is an operations center, and wherein the telecommunications network is a cable television delivery system.

172. The system of any one of claims 165 to 171, wherein the program data is programs watched data and wherein the first processor arranges the programs watched data in at least one programs watched matrix and counts the programs watched data to determine the frequency of programs watched.

173. The system of claim 172, wherein the programs watched matrix is arranged by program category and time slot and wherein the first processor reads the programs watched matrix to determine programs watched counts and sorts the programs watched counts within a time slot from highest to lowest counts.

174. The system of any one of claims 165 to 173, wherein the transmitter transmits the selected programs on a television channel, and the terminal is capable of changing television channels.

175. The system of any one of claims 165 to 174, wherein the first processor selects a plurality of programs, and the transmitter transmits the selected programs on a single television channel, and wherein the terminal is capable of masking undesired programs.

176. The system of any one of claims 165 to 175, wherein the program categories include advertisement categories, each advertisement category including at least one advertisement, and wherein the second processor selects a plurality of advertisements from the advertisement categories, and the transmitter transmits the selected advertisements on a single television channel.

177. The system of claim 176, wherein at least one advertisement within an advertisement category is an infomercial.

178. . The system of claim 176, wherein at least one advertisement within an advertisement category is a promotion.

179. The system of claim 175, wherein the second processor polls the terminals to monitor the current program being watched for the occurrence of commercial breaks, and wherein the transmitter transmits the selected advertisements in response to the occurrence of the commercial breaks determined by the second processor.

180. The system of any one of claims 165 to 179, wherein the terminal comprises a memory that stores programs watched data, the system further comprising a receiver operably coupled to the first processor that receives the stored programs watched data from the terminal.

181. The system of claim 180, wherein the second processor polls the terminal and wherein the receiver receives status reports sent by the terminal, the receiver further comprising:

a second memory that stores the programs watched data;

a message generator that generates a polling request message, the message directing the terminal to initiate transmission of the terminal status reports, the terminal status reports containing programs watched information, wherein the first processor processes the received terminal status reports to produce polling response data and the second memory stores the polling response data.

182. The system of claim 180, wherein the terminal transmits a terminal status report that contains the programs watched data to the receiver using a random access method.

183. The system of claim 182, wherein the random access method further comprises a CDMA/CD protocol.

184. The system of claim 180, wherein the terminal transmits a terminal status report that contains the programs watched data to the receiver using a standard telephone line.

185. The system of claim 181, the first processor further comprising a demodulator that demodulates the received terminal status reports, wherein the first processor:

reads at least one information field in the demodulated terminal data;

appends each information field to a terminal identification number field; and

sorts each information field in the received terminal status reports by terminal identification number, and wherein the second memory accumulates the sorted information fields for each terminal, the first processor using the accumulated sorted information fields to produce the polling response data.

186. The system of claim 185, wherein the first processor updates the programs watched data in the second memory with the polling response data.

187. The system of any one of claims 165 to 186, wherein the first processor gathers demographic data from subscribers and correlates the demographic data with the categories of programs.

188. The system of claim 187, wherein a group of subscribers forms a statistically significant number of subscribers, and the first processor uses both the gathered demographic data and simulated demographic profiles as the demographic data, and wherein the first processor:

gathers demographic data from the statistically significant group of subscribers; and

generates a simulated demographic profile of the subscribers to be simulated by comparing the programs watched data of the subscribers to be simulated with the gathered demographic data and the programs watched data of the statistically significant group of subscribers.

189. The system of any one of claims 165 to 188, wherein the terminal is located in the set top box and the first processor is located at a site remote from the set top box.

190. The system of claim 189, wherein the site is a cable television headend.

191. The system of claim 190, wherein the site is an operations center.

192. The system of any one of claims 165 to 191, wherein the terminal gather programs watched data from a plurality of subscribers, wherein the first processor processes the programs watched data gathered from the plurality of subscribers, and wherein the transmitter transmits the selected programs to the plurality of subscribers.

193. A method for determining program ratings at an operations center using set top terminals, comprising:

receiving programs watched information from the set top terminals in an upstream data transmission at a cable television headend;

transmitting the programs watched information from the cable television headend to the operations center;

gathering the transmitted programs watched information from the set top terminals to form a database of program watched information at the operations center; and

calculating program ratings, wherein the program ratings are calculated using the programs watched database.

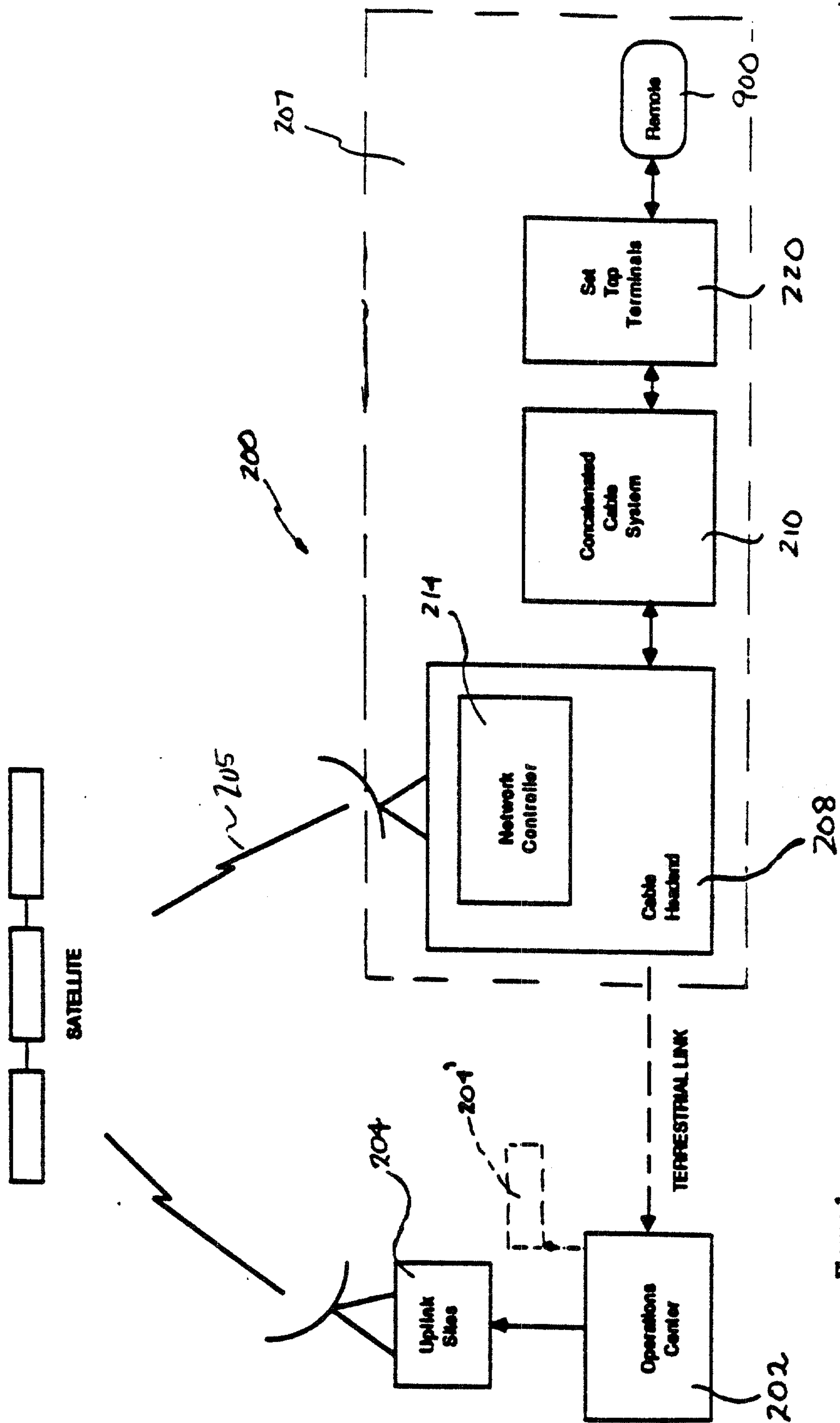


Figure 1

Figure 2

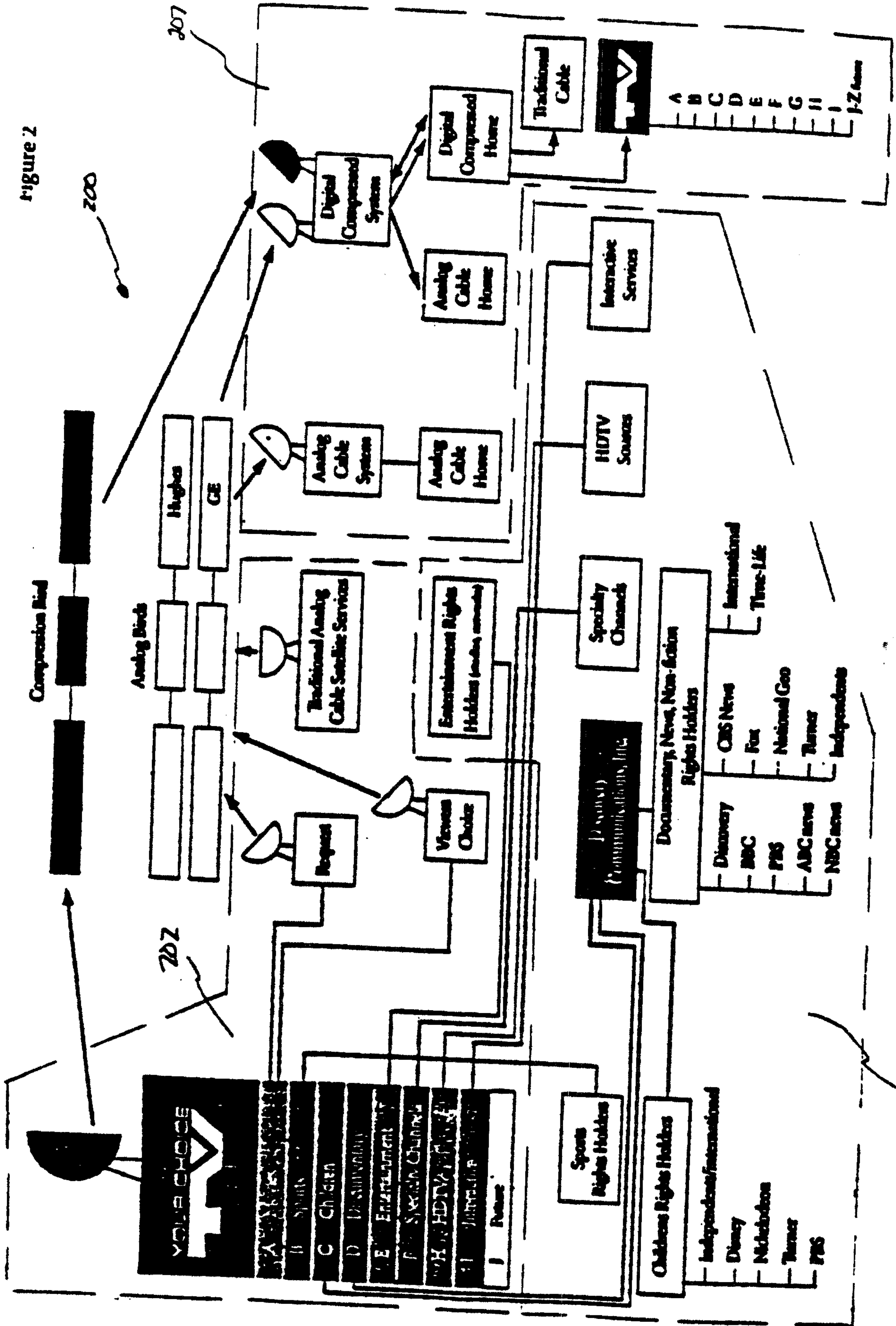
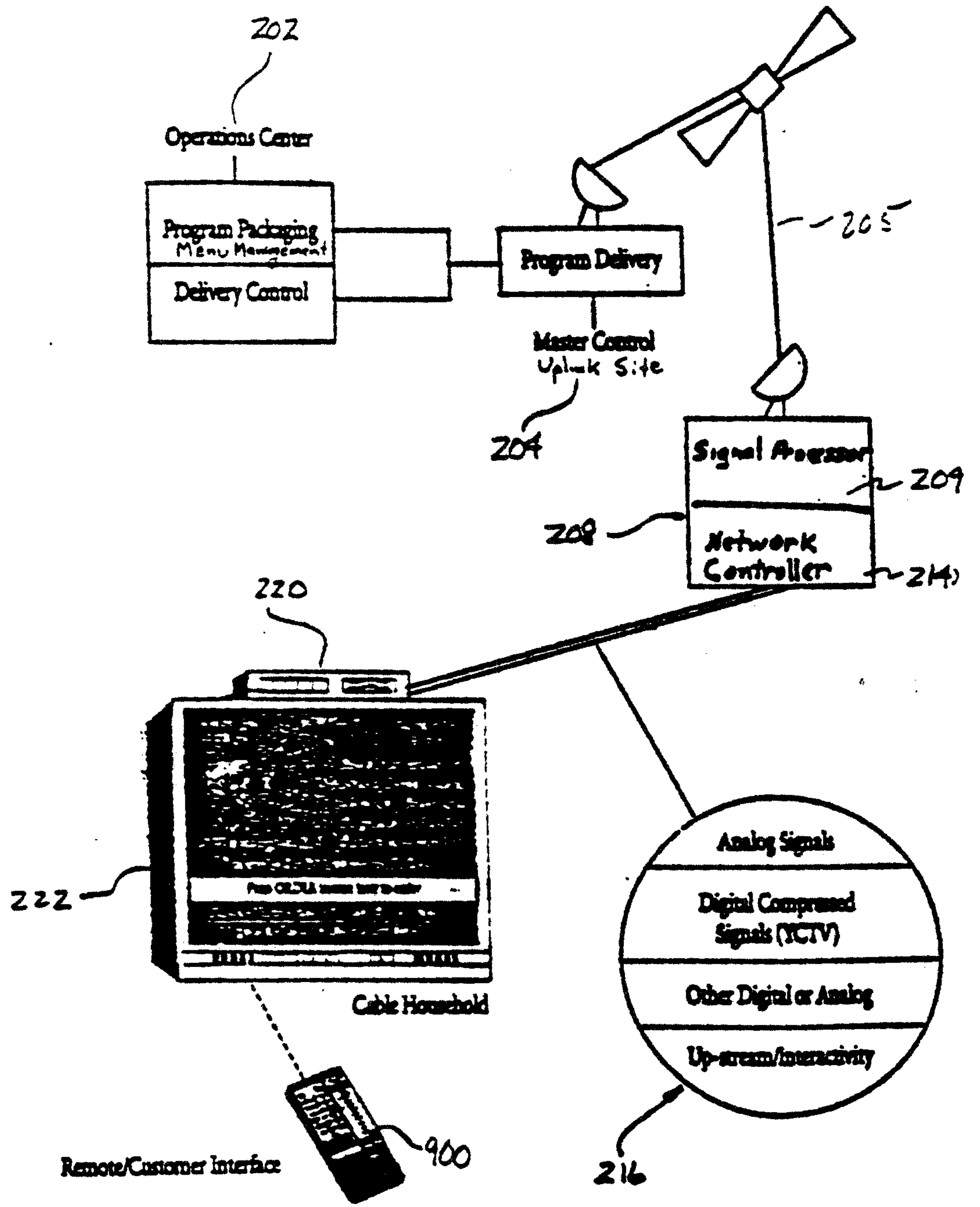


Figure 3



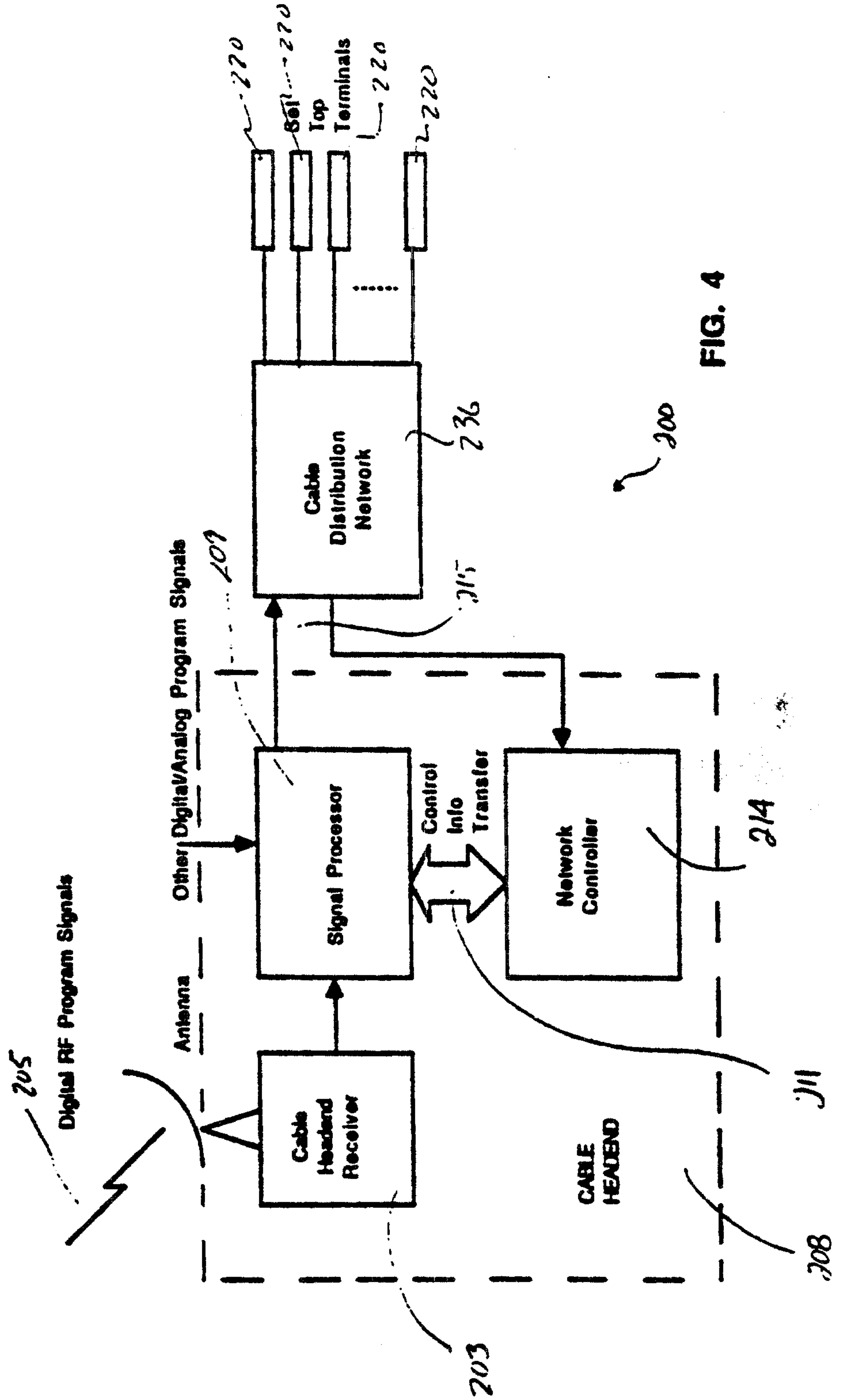
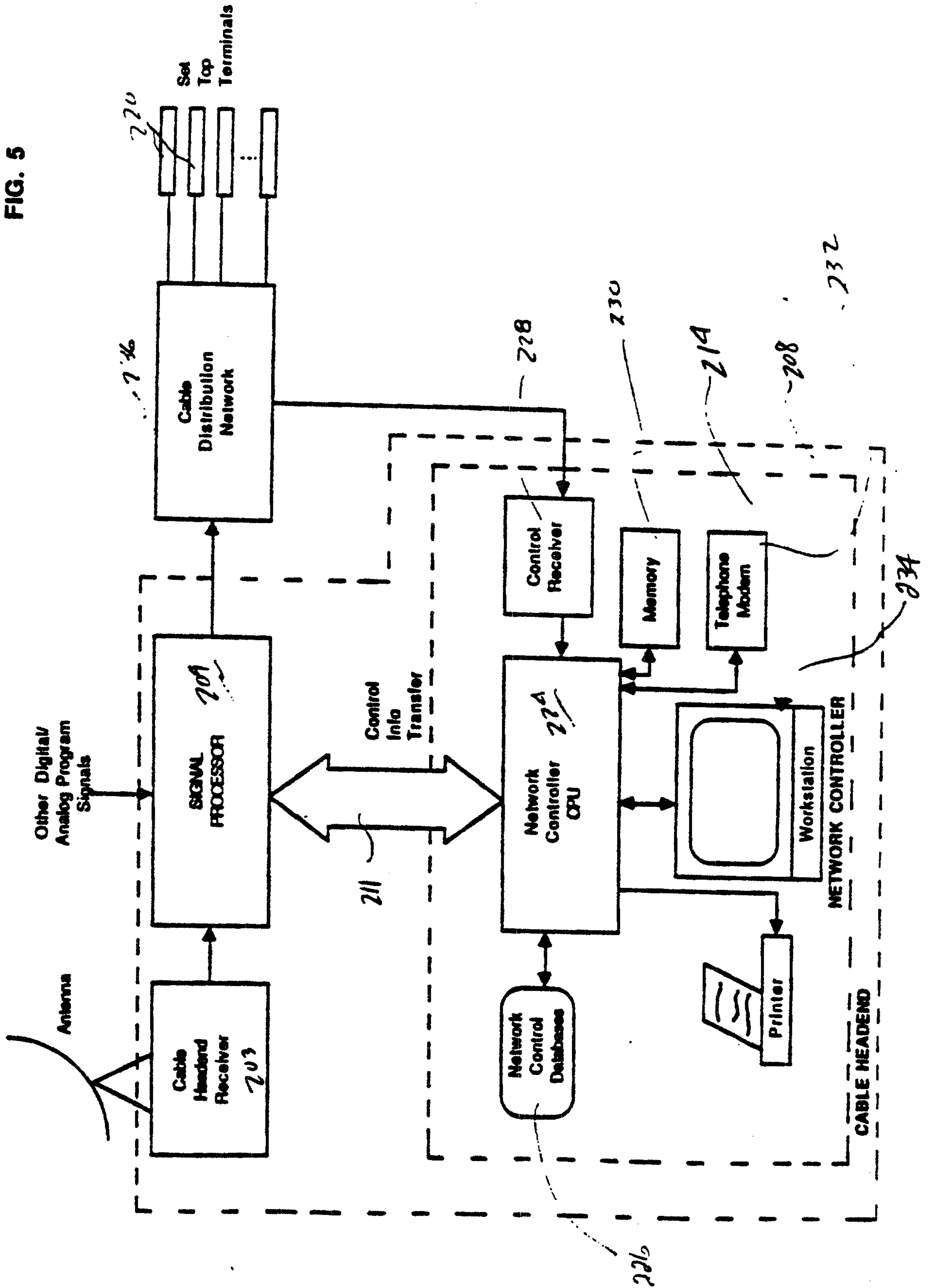


FIG. 4

FIG. 5



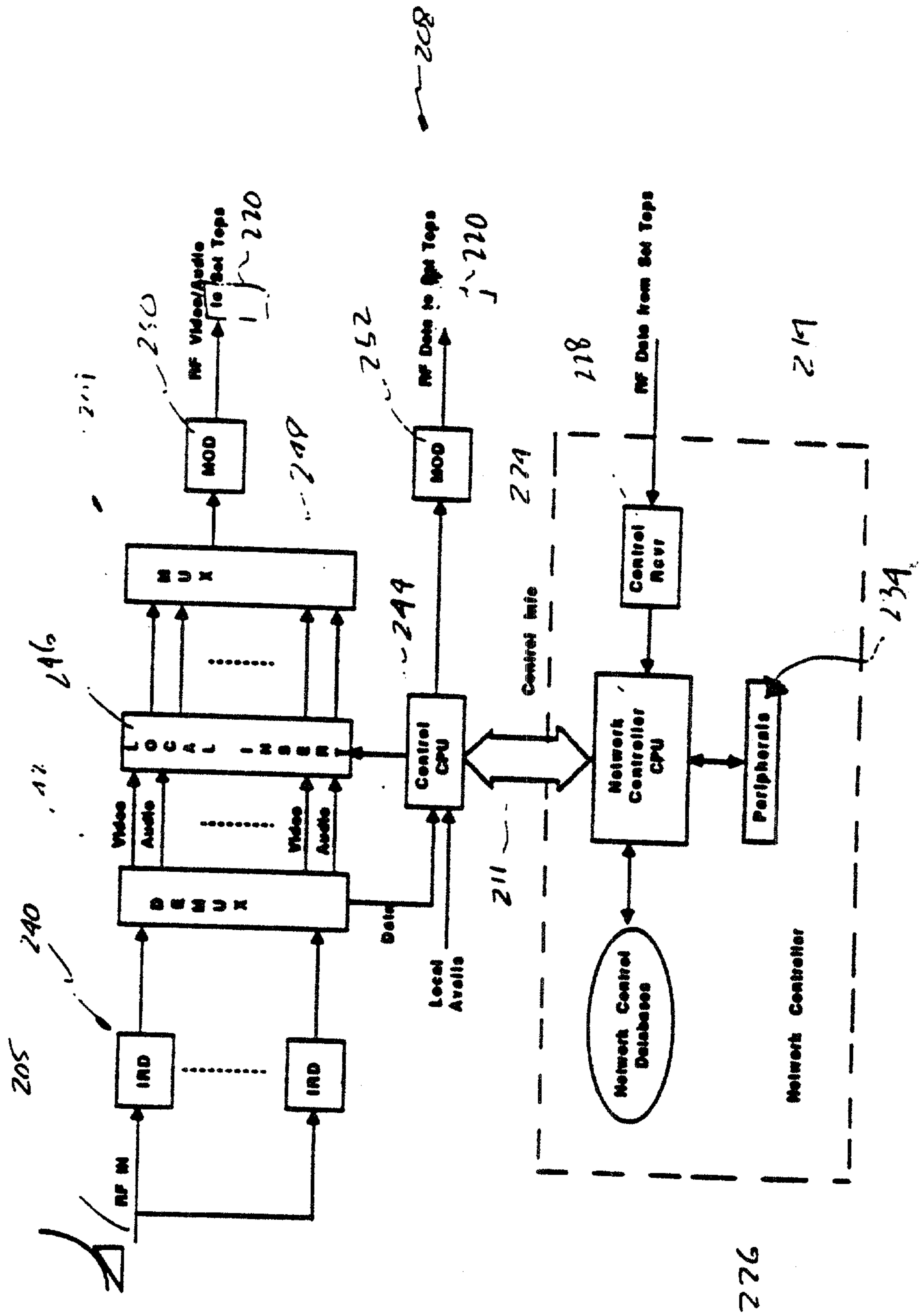


Fig. 6a

BASIC CABLE HEADEND WITH NETWORK CONTROLLER

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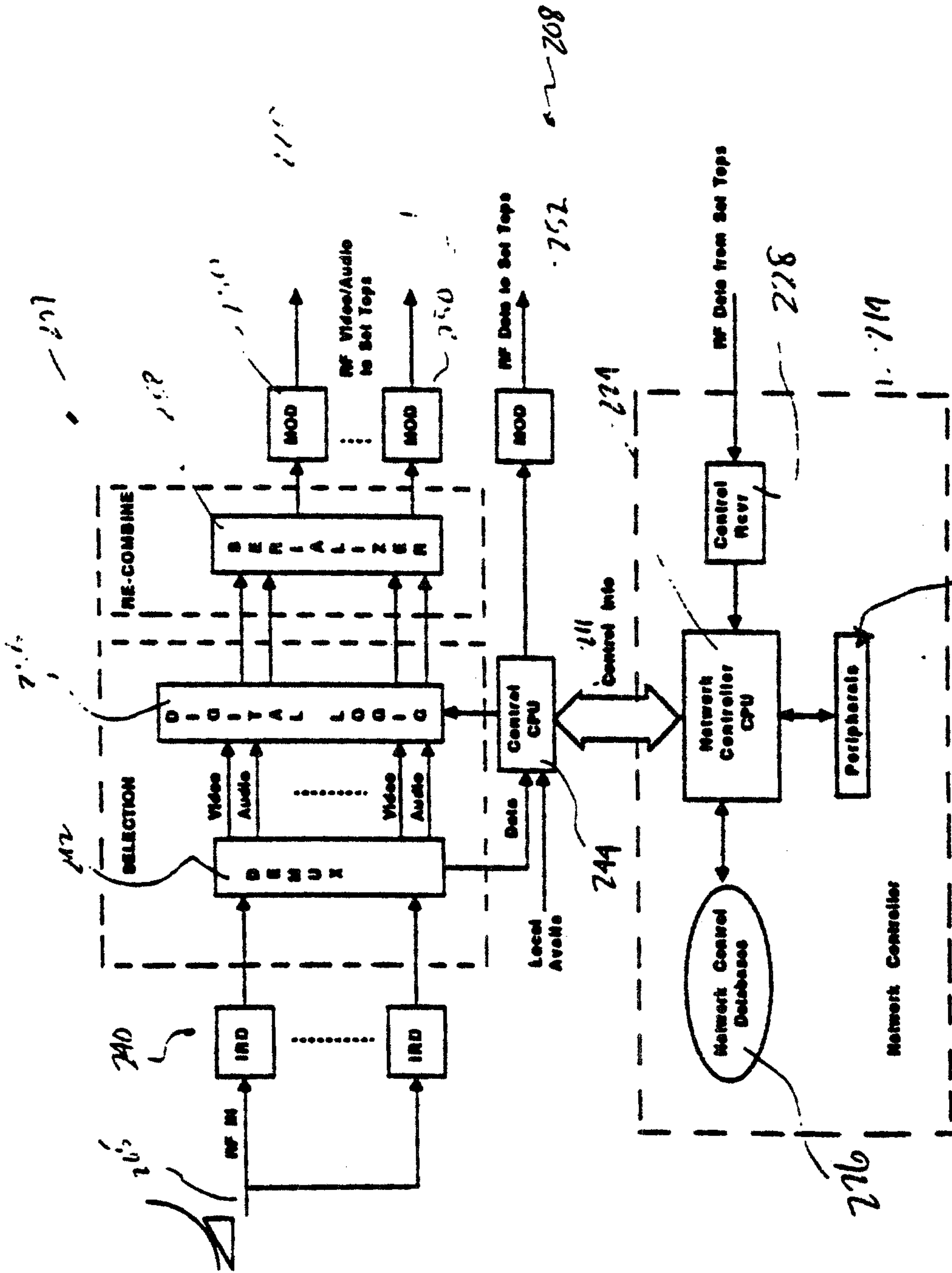


Fig. 6b

CABLE HEADEND WITH COMBINER AND NETWORK CONTROLLER

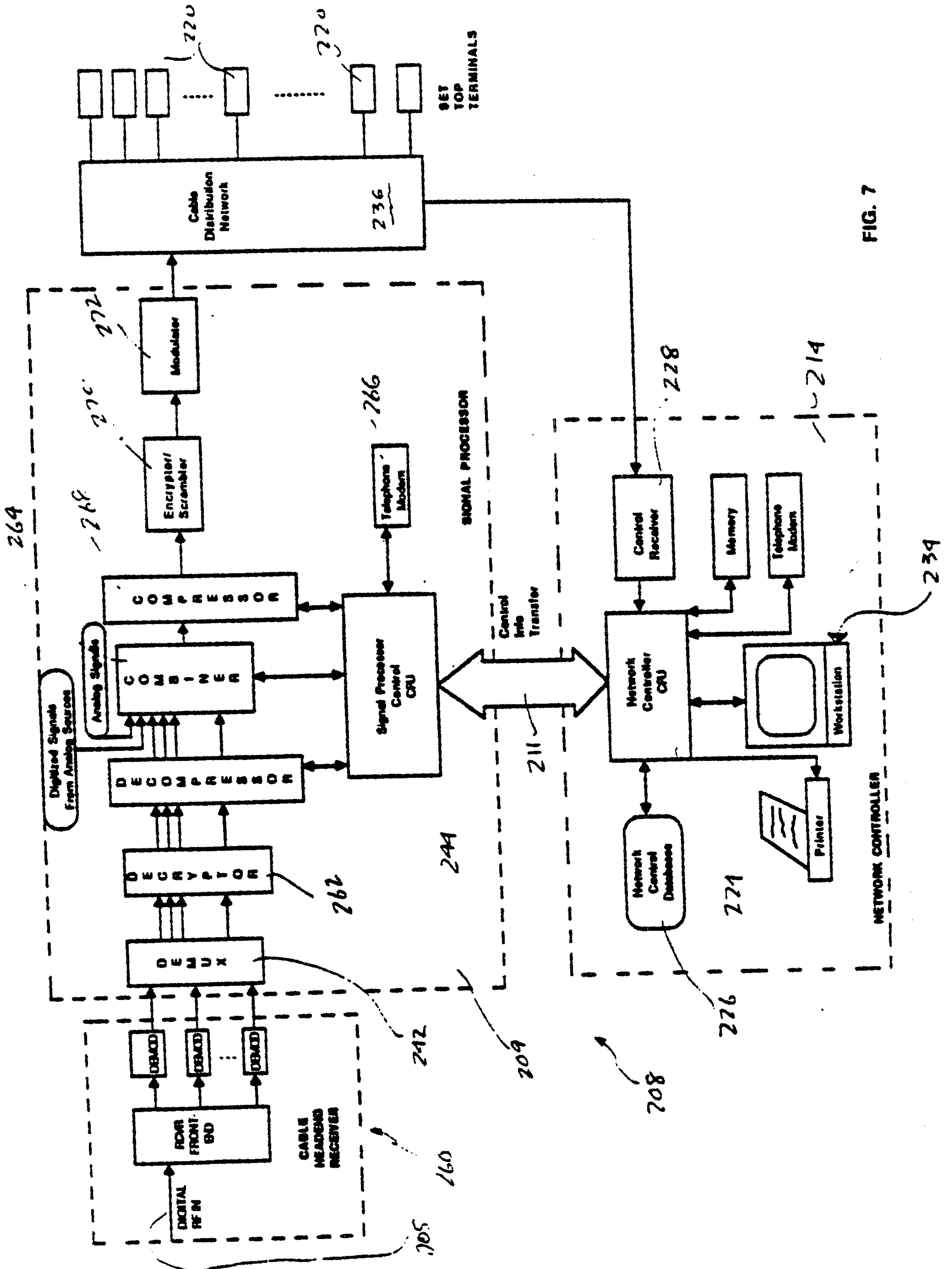
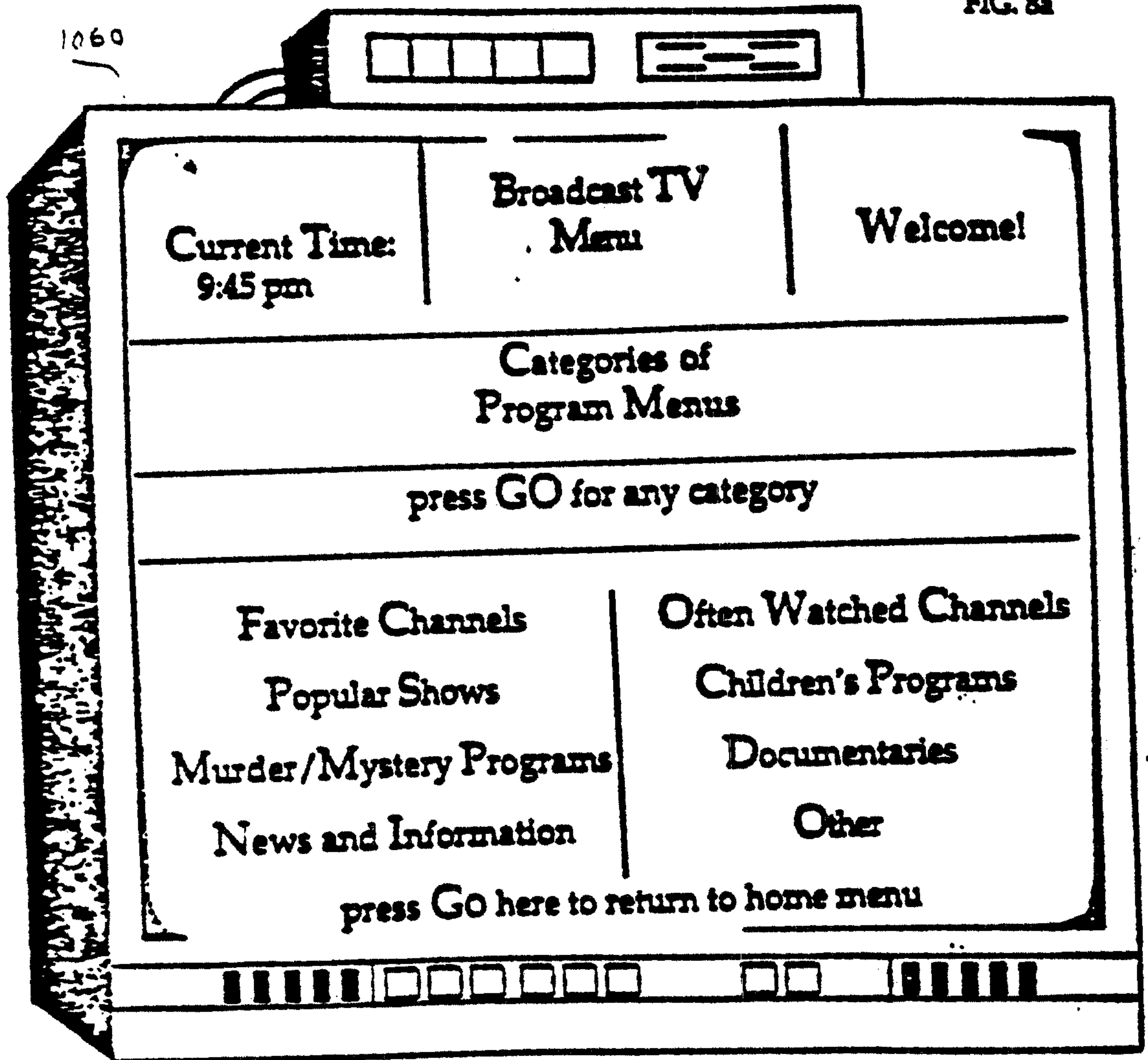


FIG. 7

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FIG. 8a



1060

Current Time:
9:45 pm

Broadcast TV
Menu

Welcome!

Categories of
Program Menus

press GO for any category

Favorite Channels

Often Watched Channels

Popular Shows

Children's Programs

Murder/Mystery Programs

Documentaries

News and Information

Other

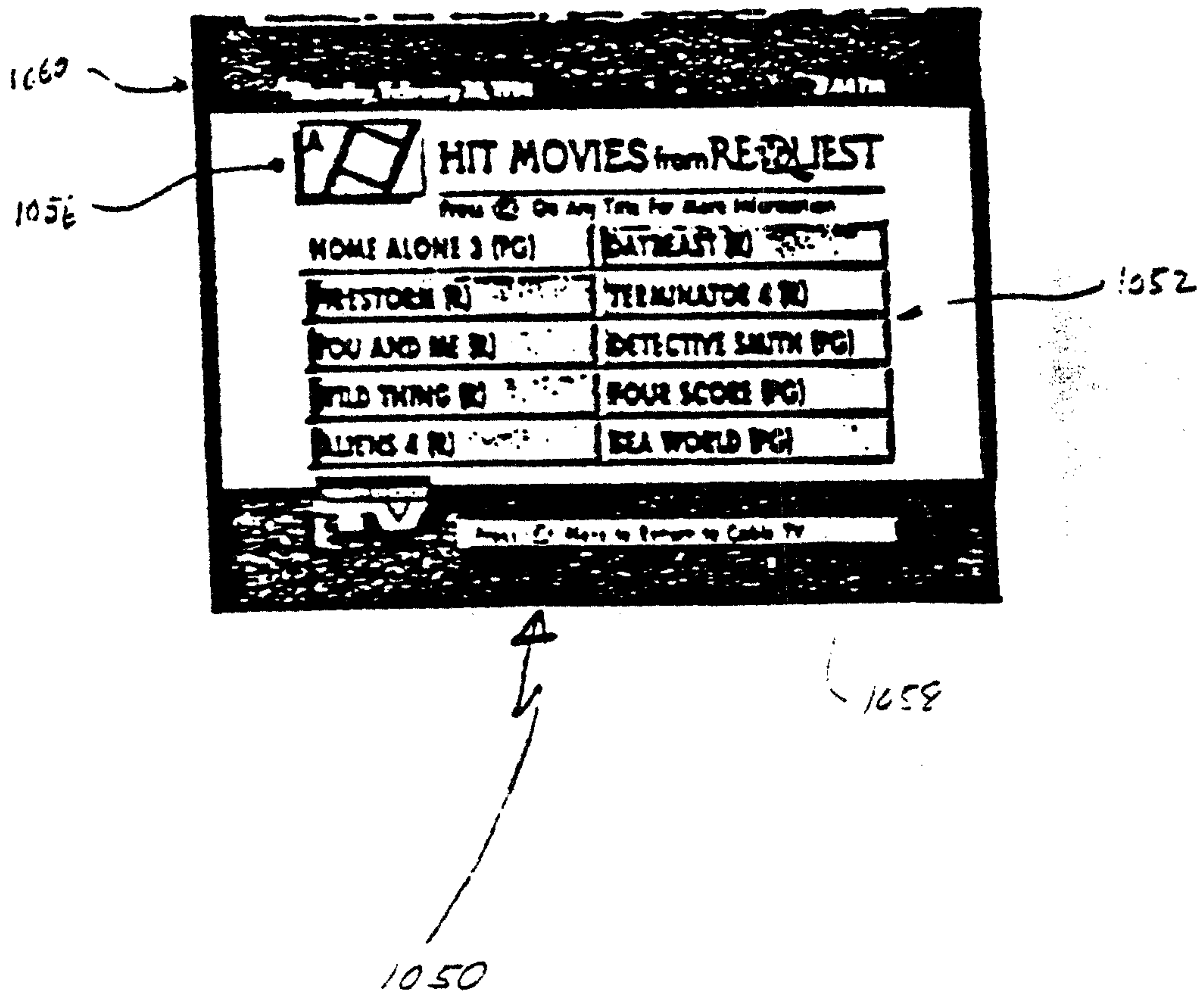
press GO here to return to home menu

↑
1061

1048

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FIG. 8b

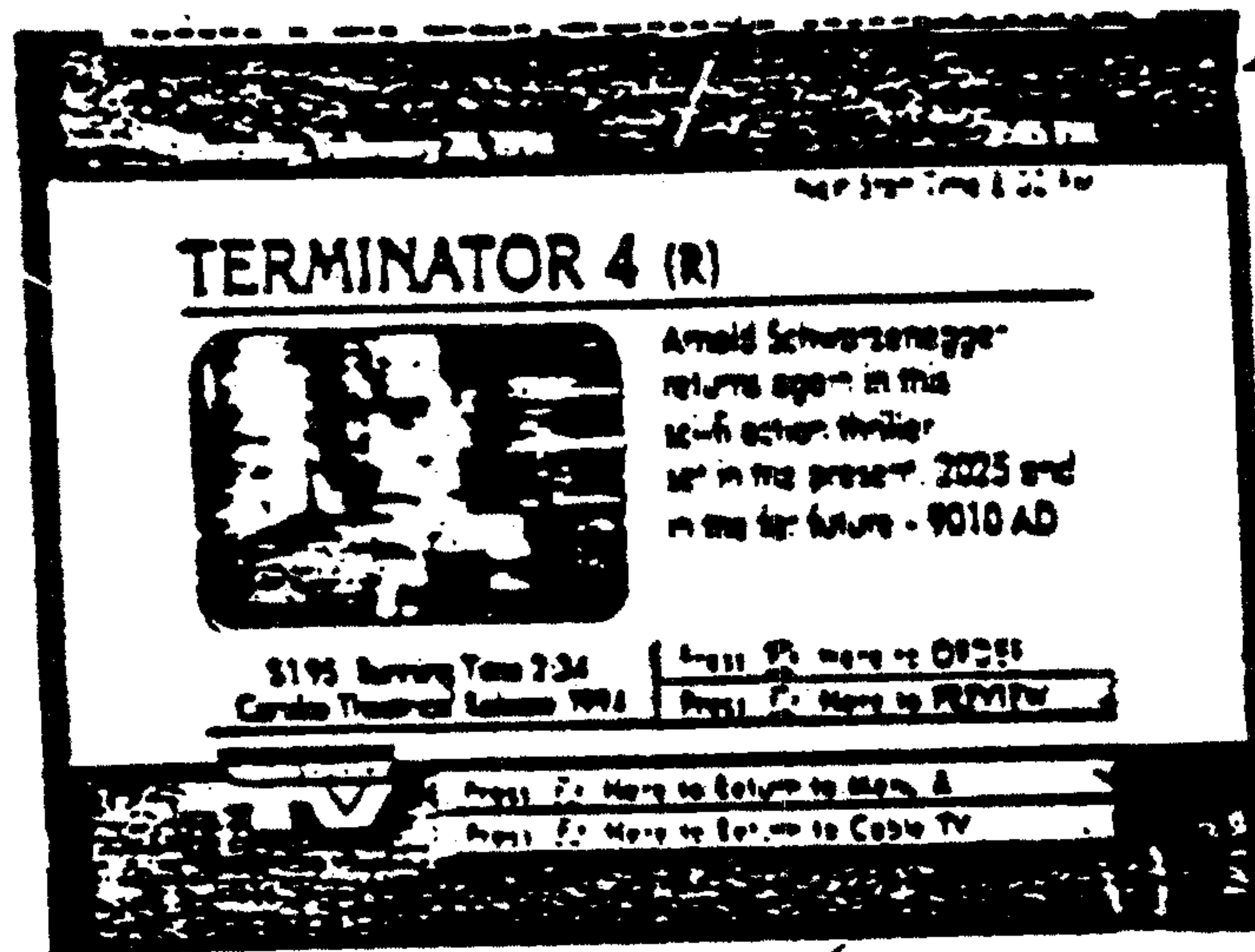


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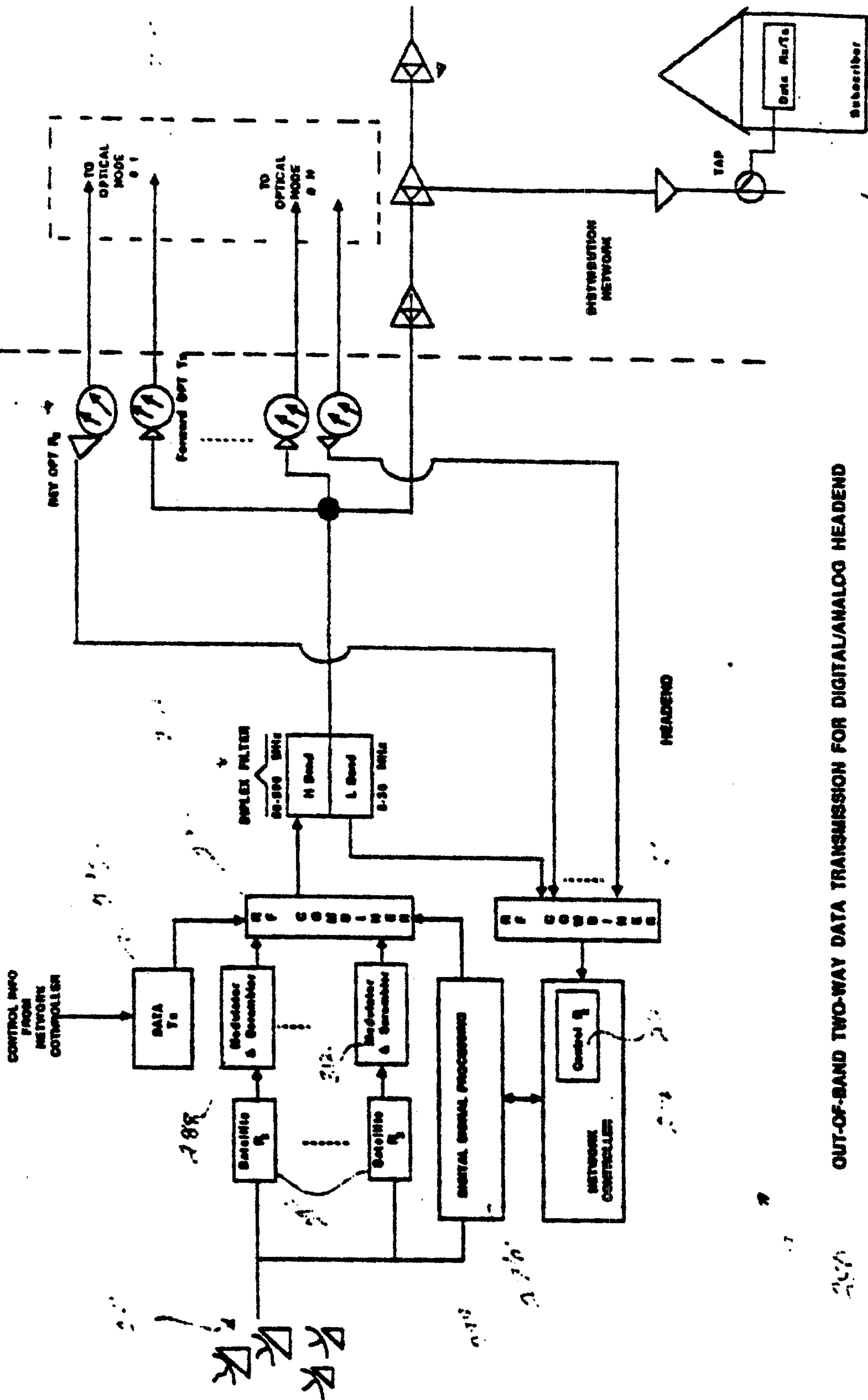
Figure 8c



1060

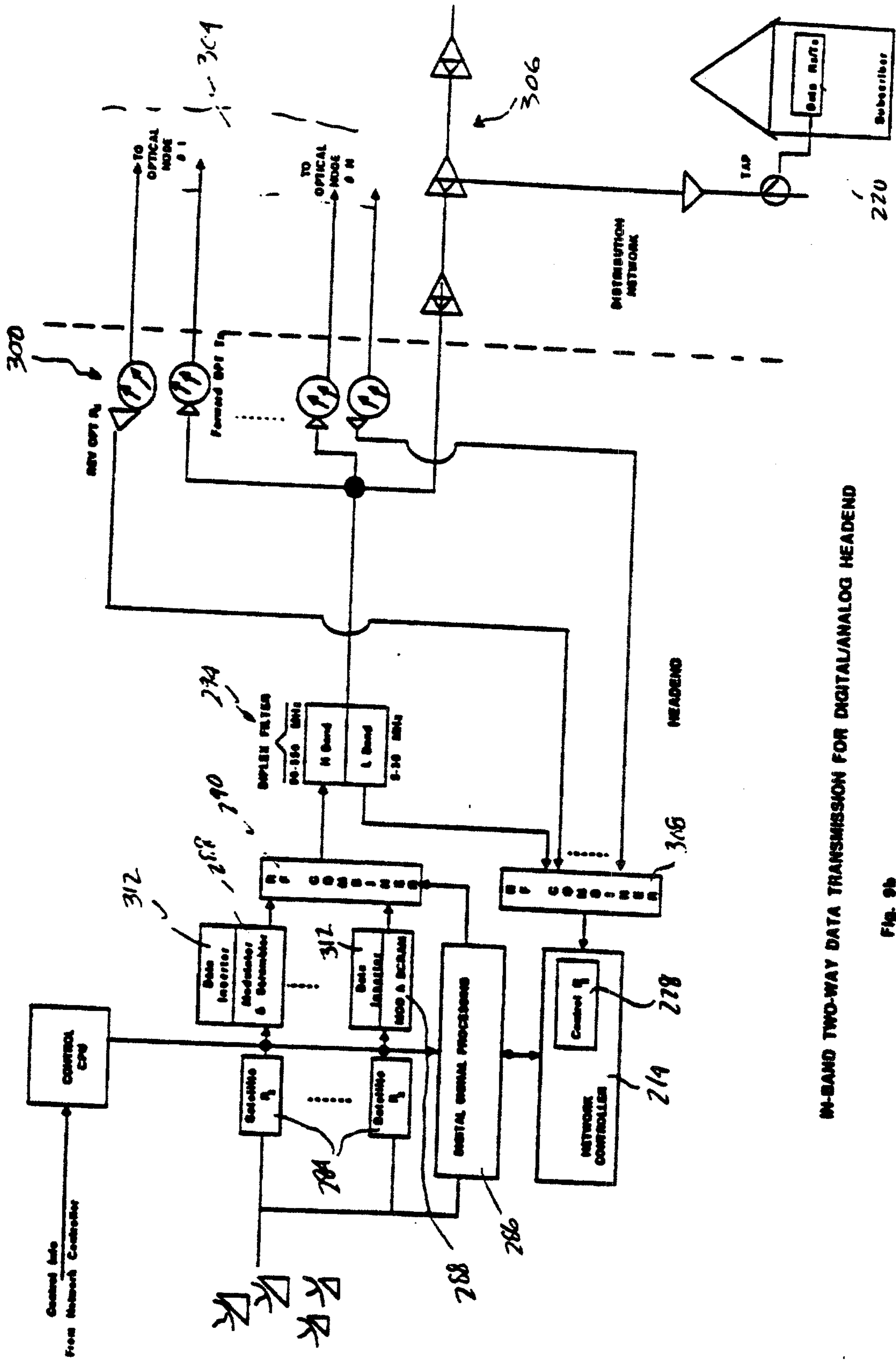
1058

1054



OUT-OF-BAND TWO-WAY DATA TRANSMISSION FOR DIGITAL/ANALOG HEADEND

Fig. 9a



IN-BAND TWO-WAY DATA TRANSMISSION FOR DIGITAL/ANALOG HEADEND

Fig. 9b

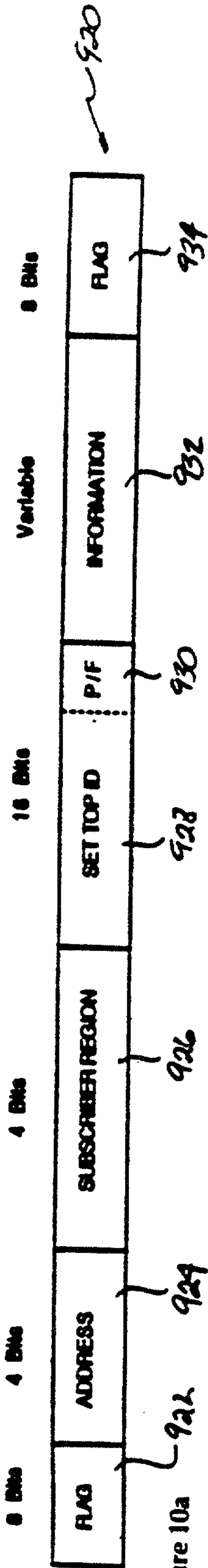


Figure 10a

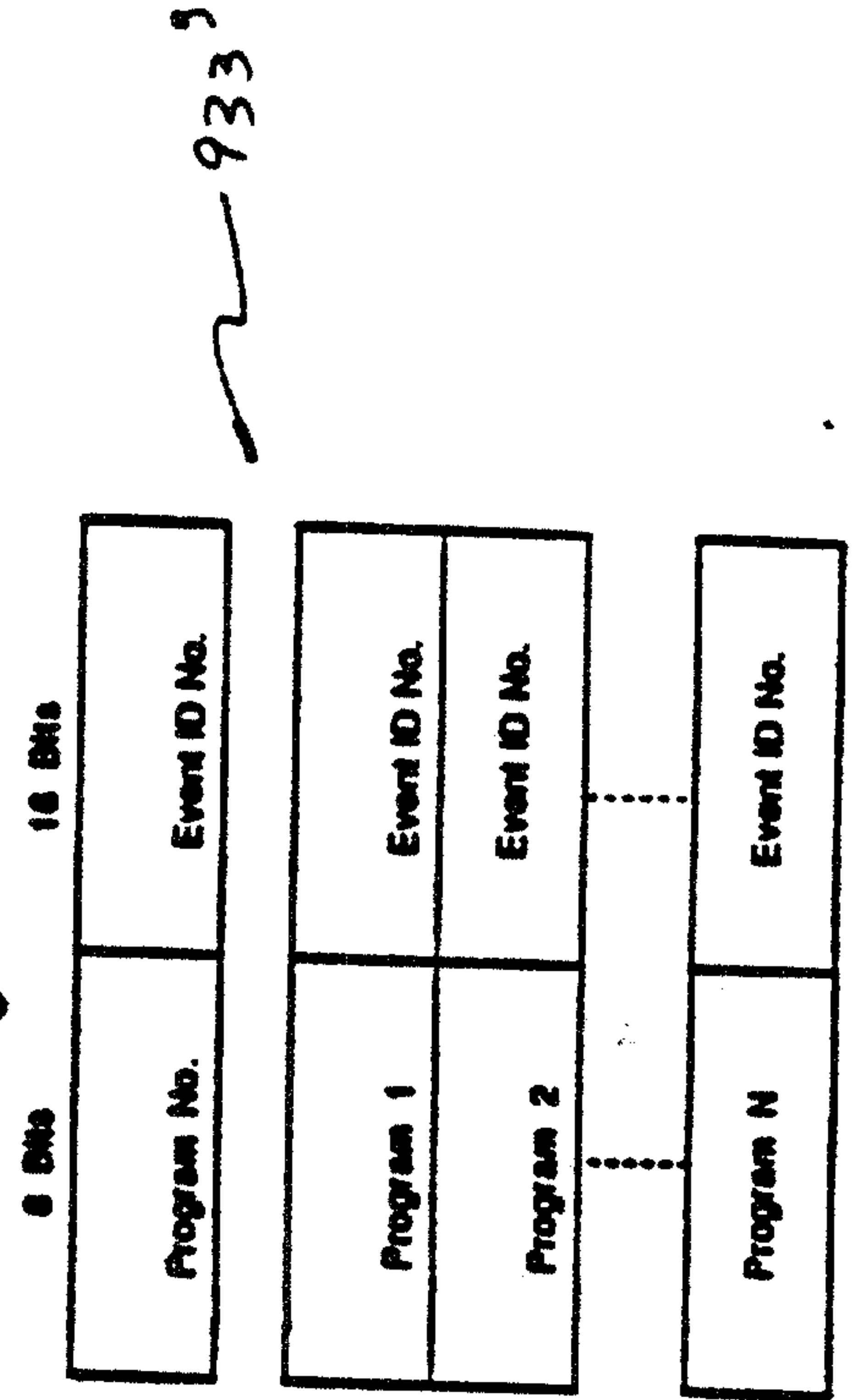
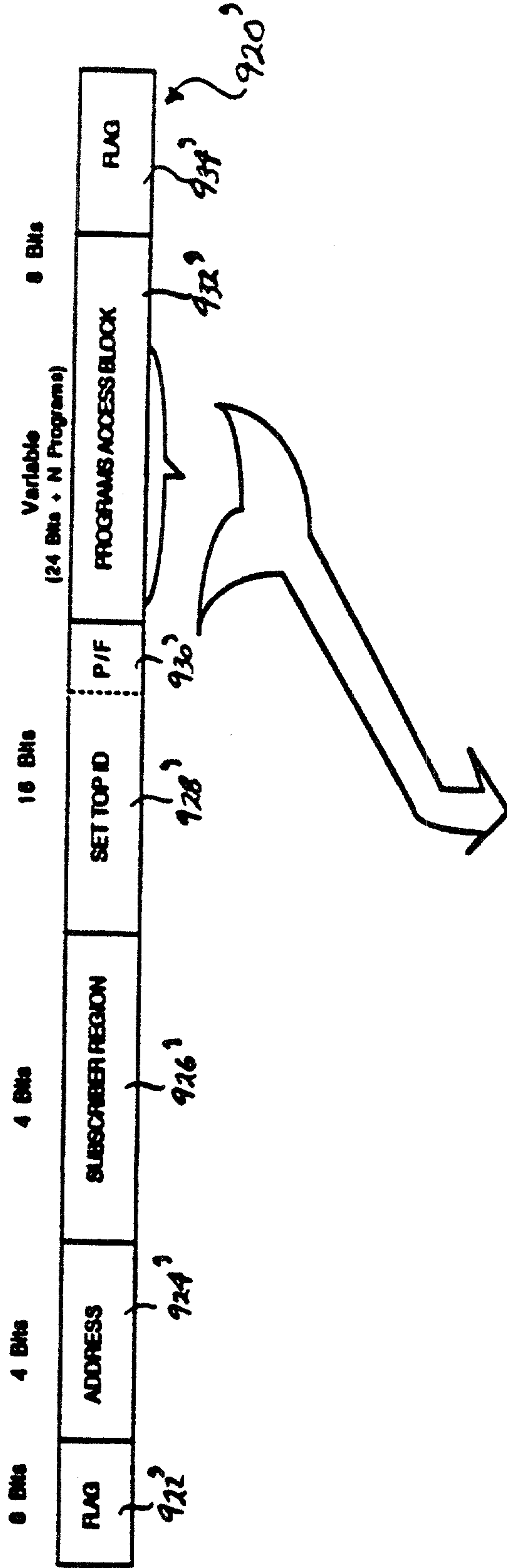


Figure 10b

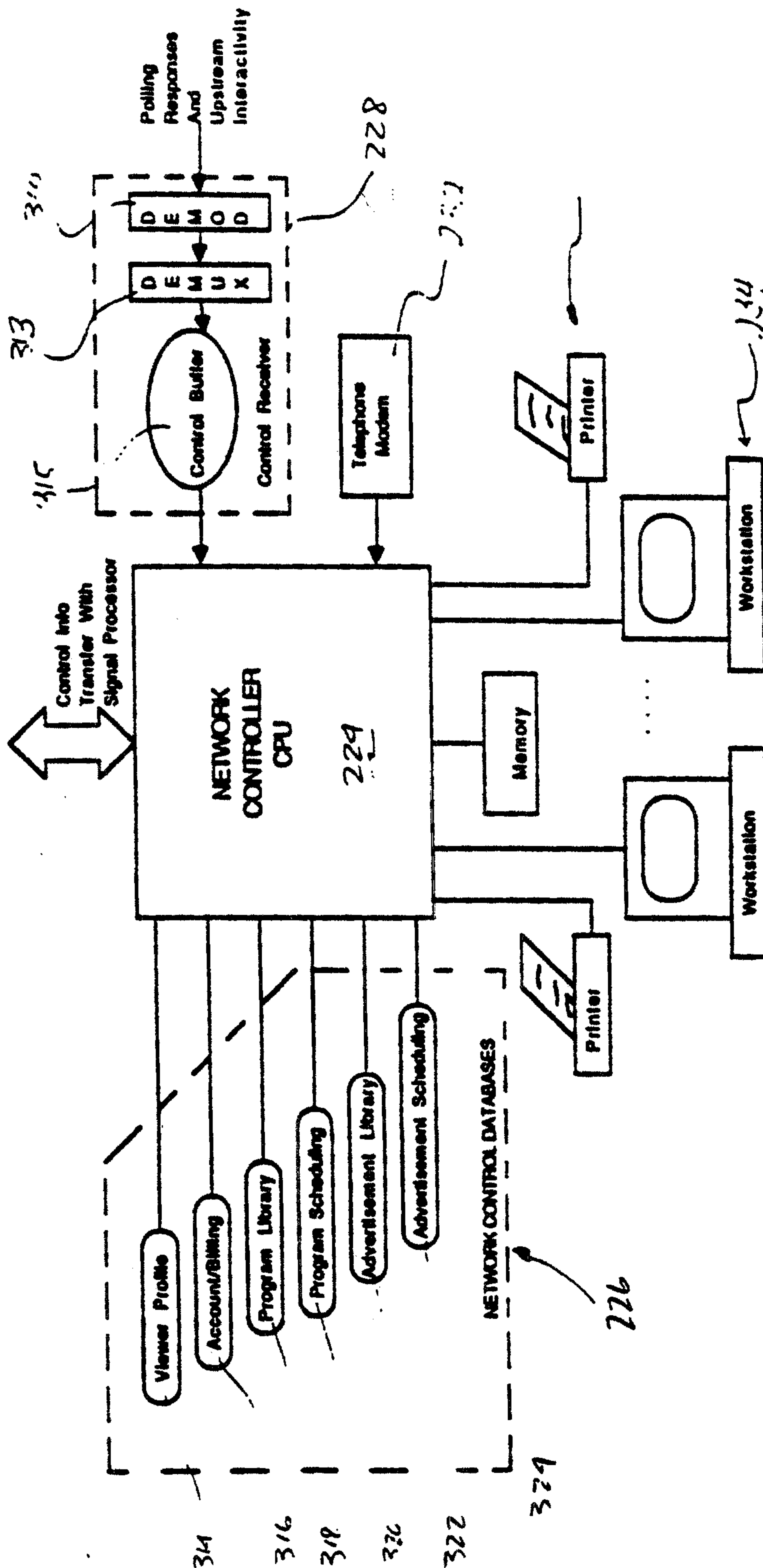


FIG. 11

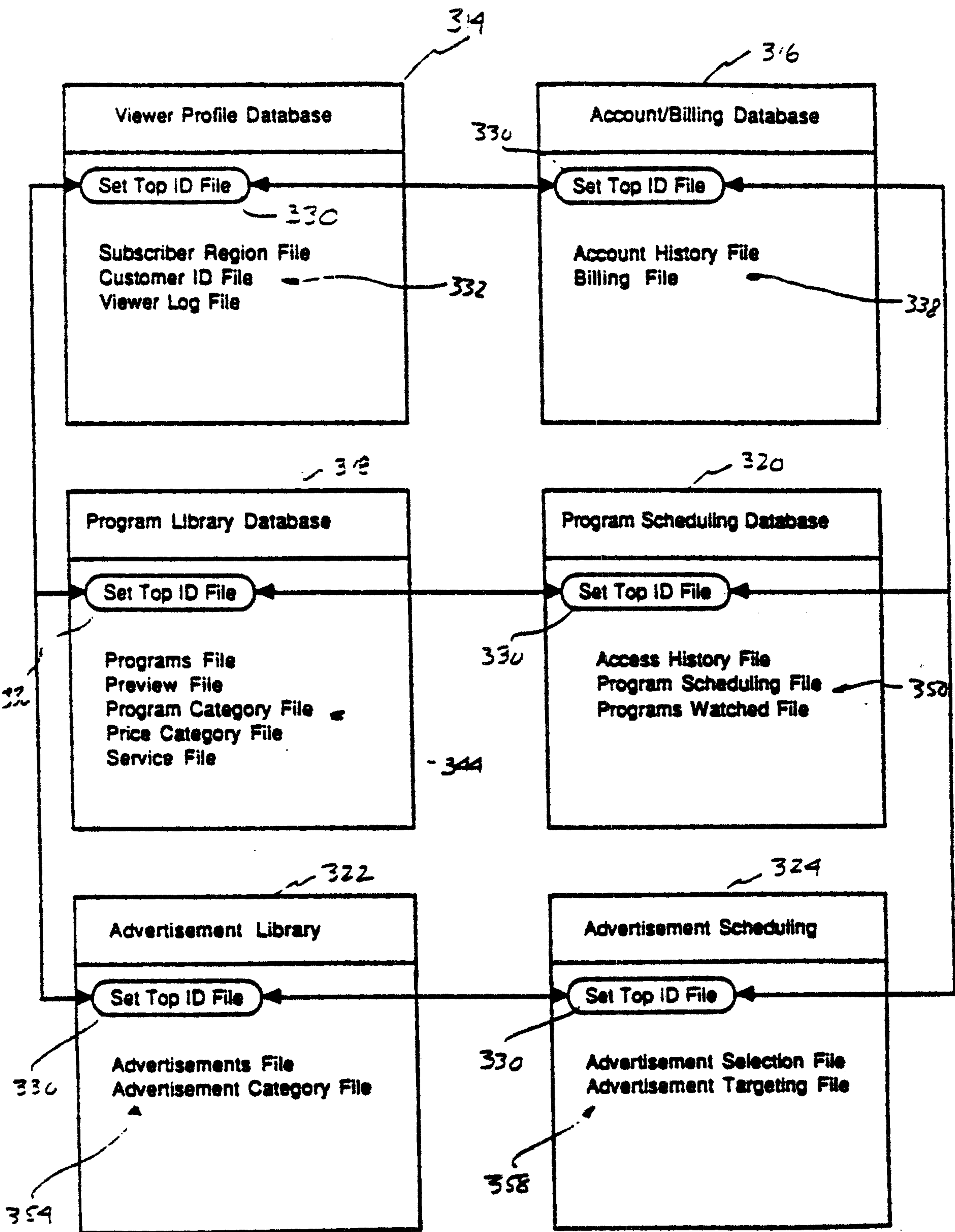


FIG. 12

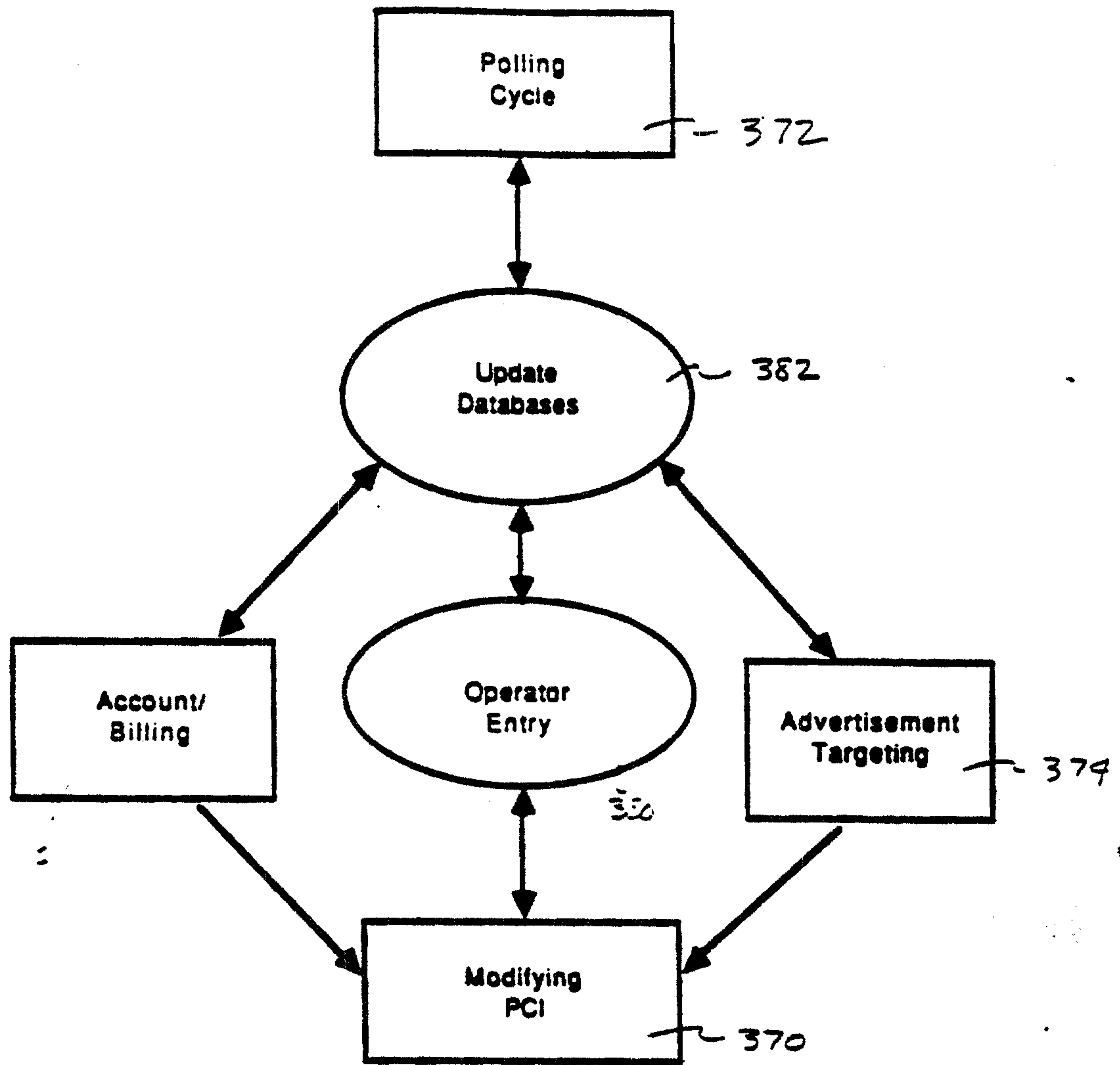


FIG. 13

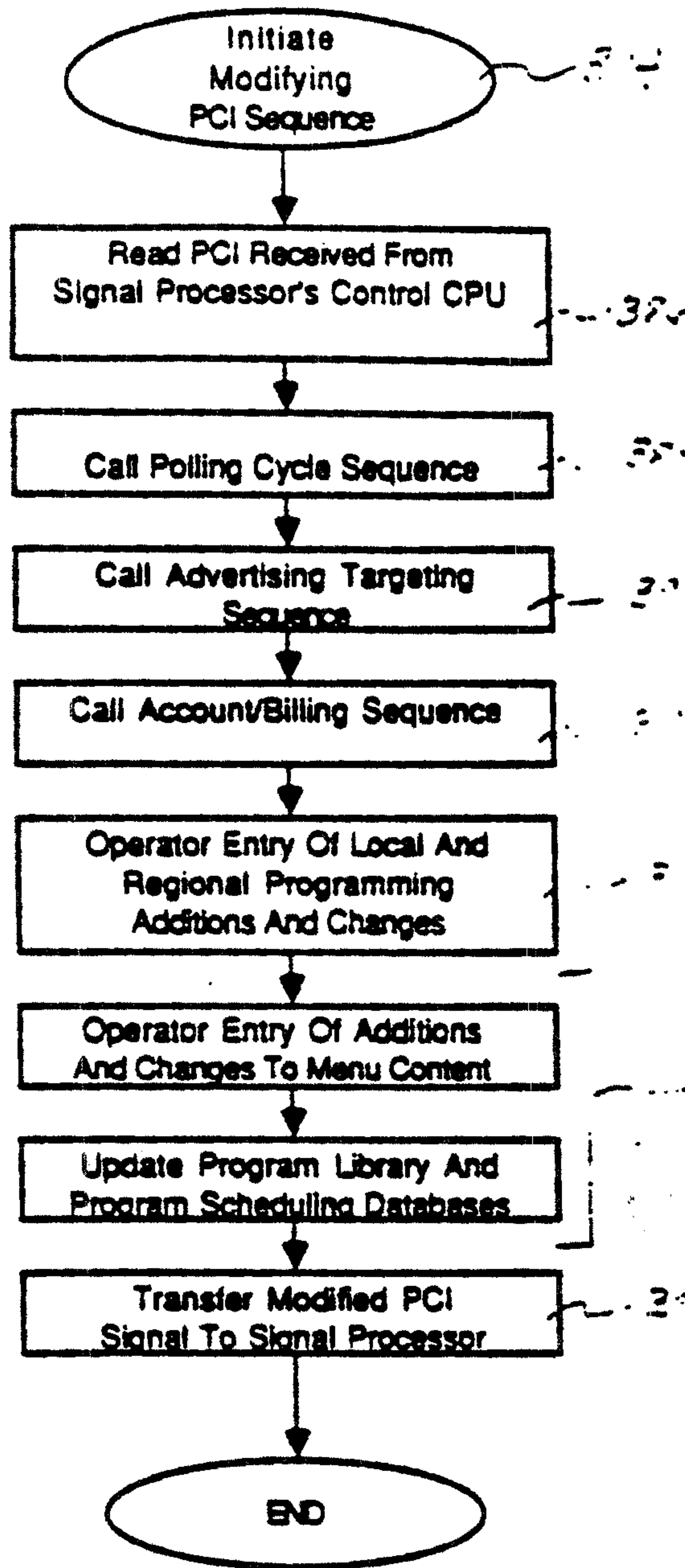


FIG. 14

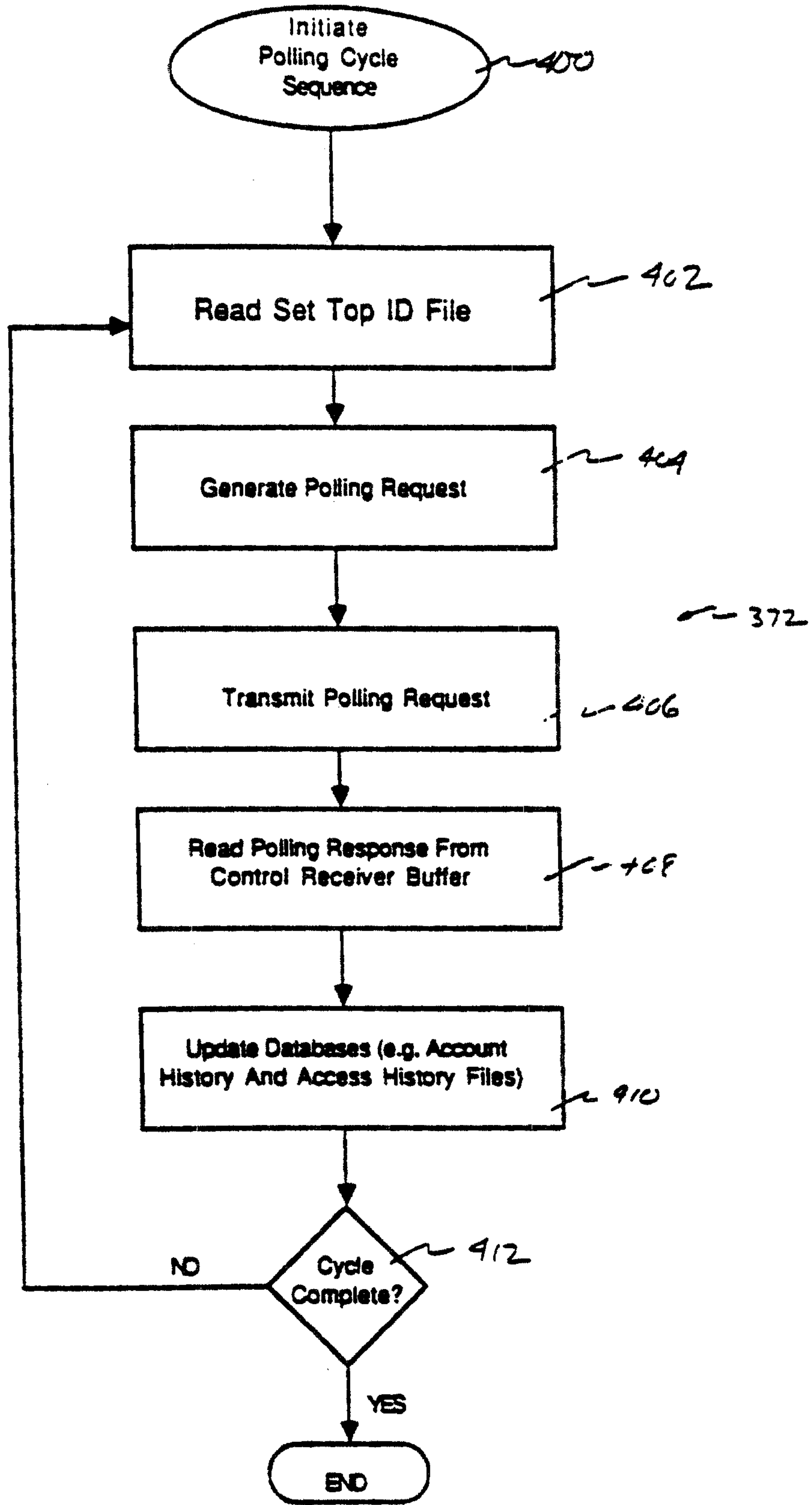


FIG. 15

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MONTHLY PROGRAMS WATCHED MATRIX

PROGRAM CATEGORIES

	SPORTS	NEWS	MOVIES	CHILDREN	ENTERTAINMENT
0000-0400	0	2	2	0	0
0400-0800	0	2	0	3	0
0800-1200	2	0	10	2	6
1200-1600	20	1	3	5	4
1600-2200	8	6	13	0	5
2000-2400	0	10	2	4	2

**TIME
SLOT**

FIG. 16

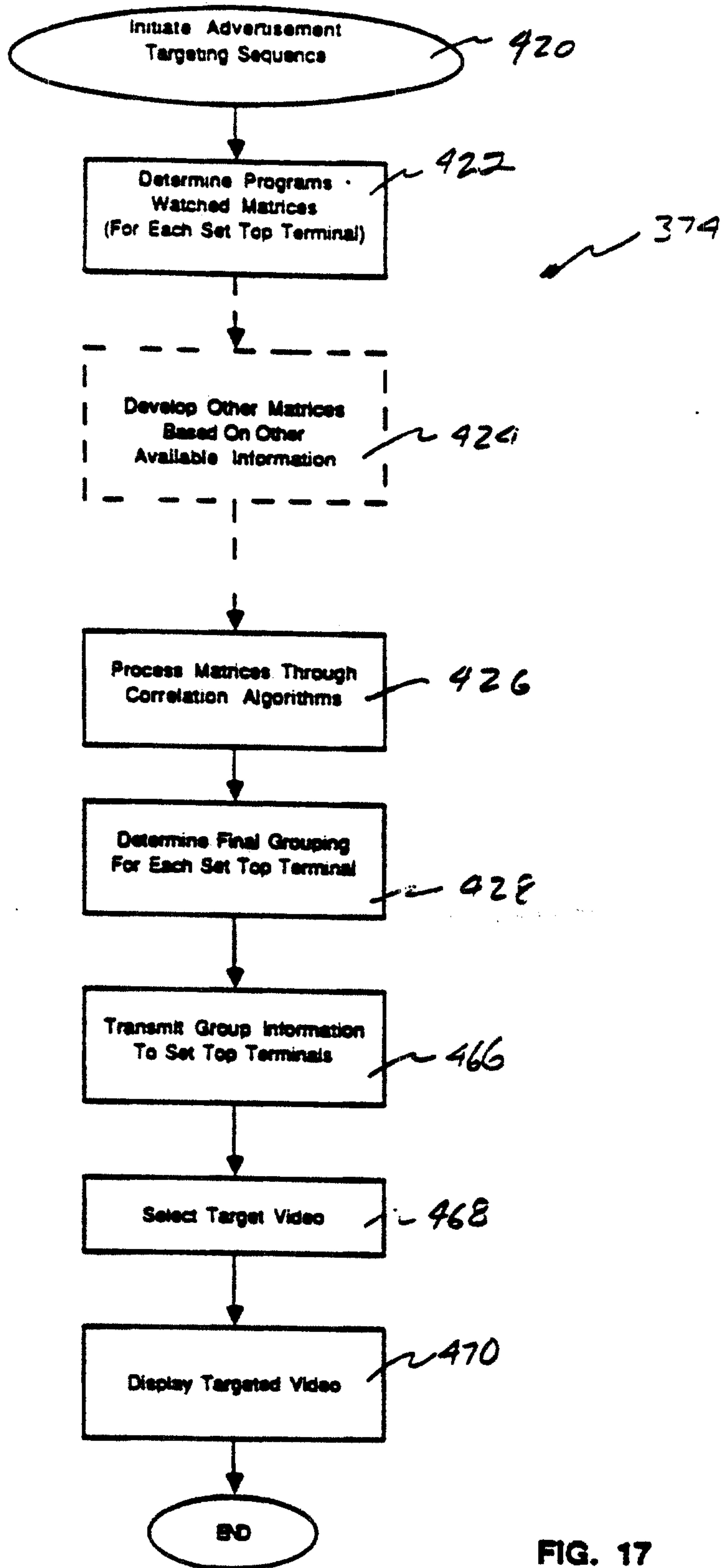


FIG. 17

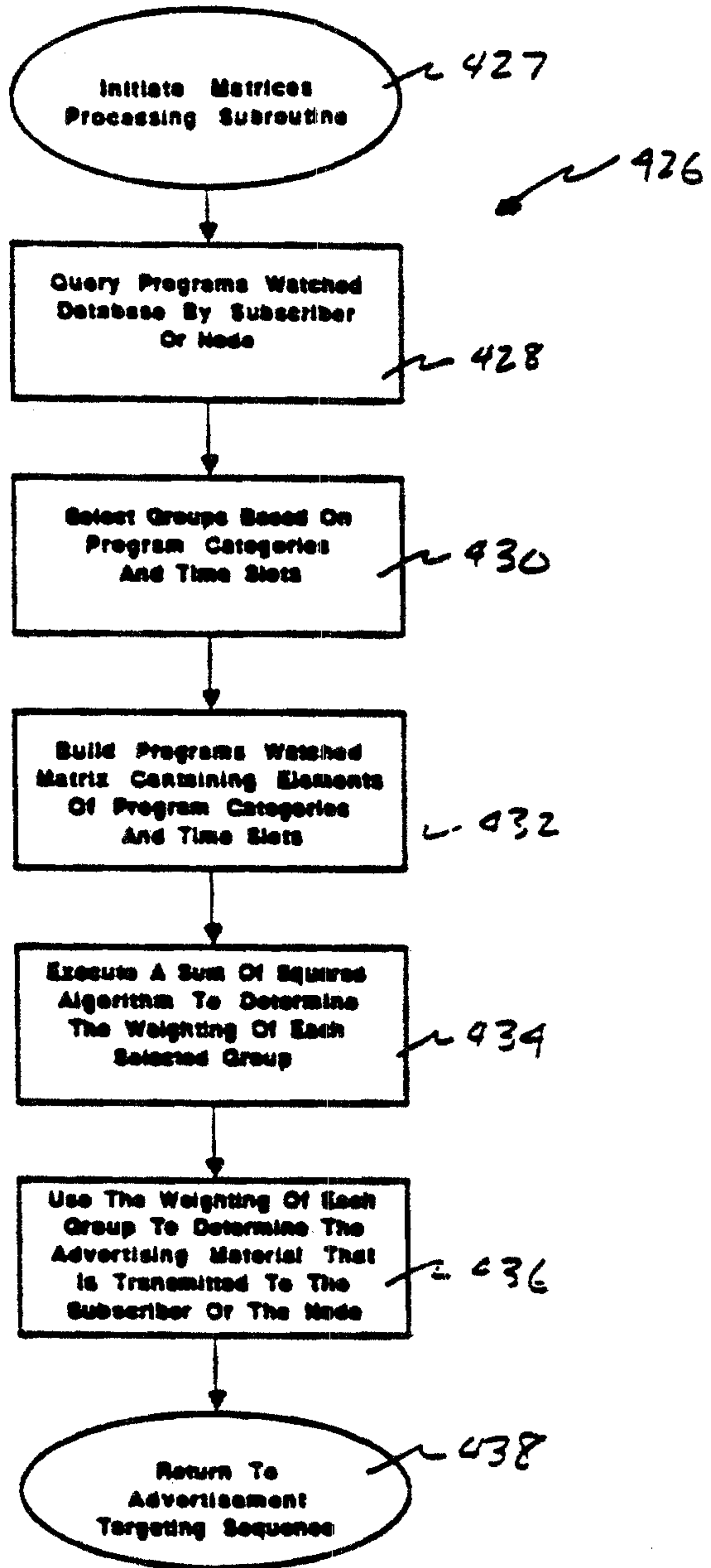


FIG. 18

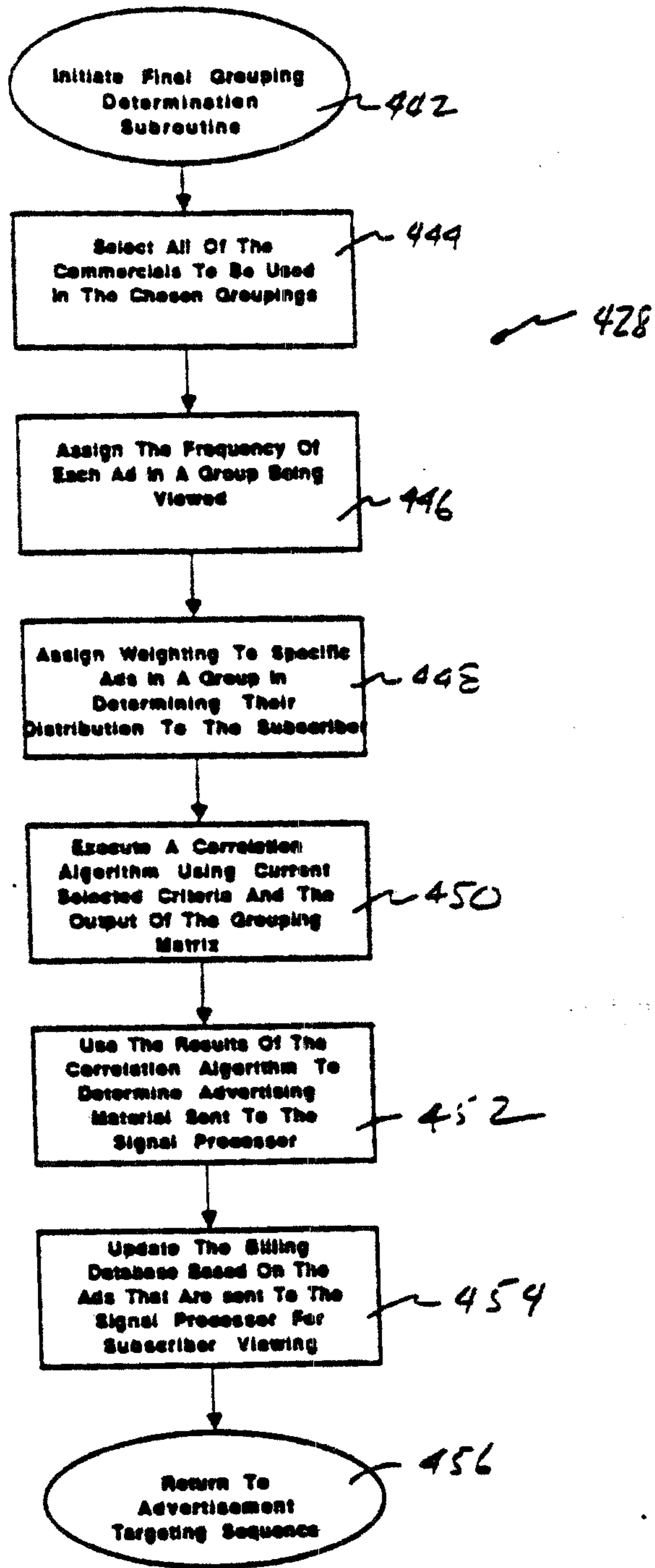
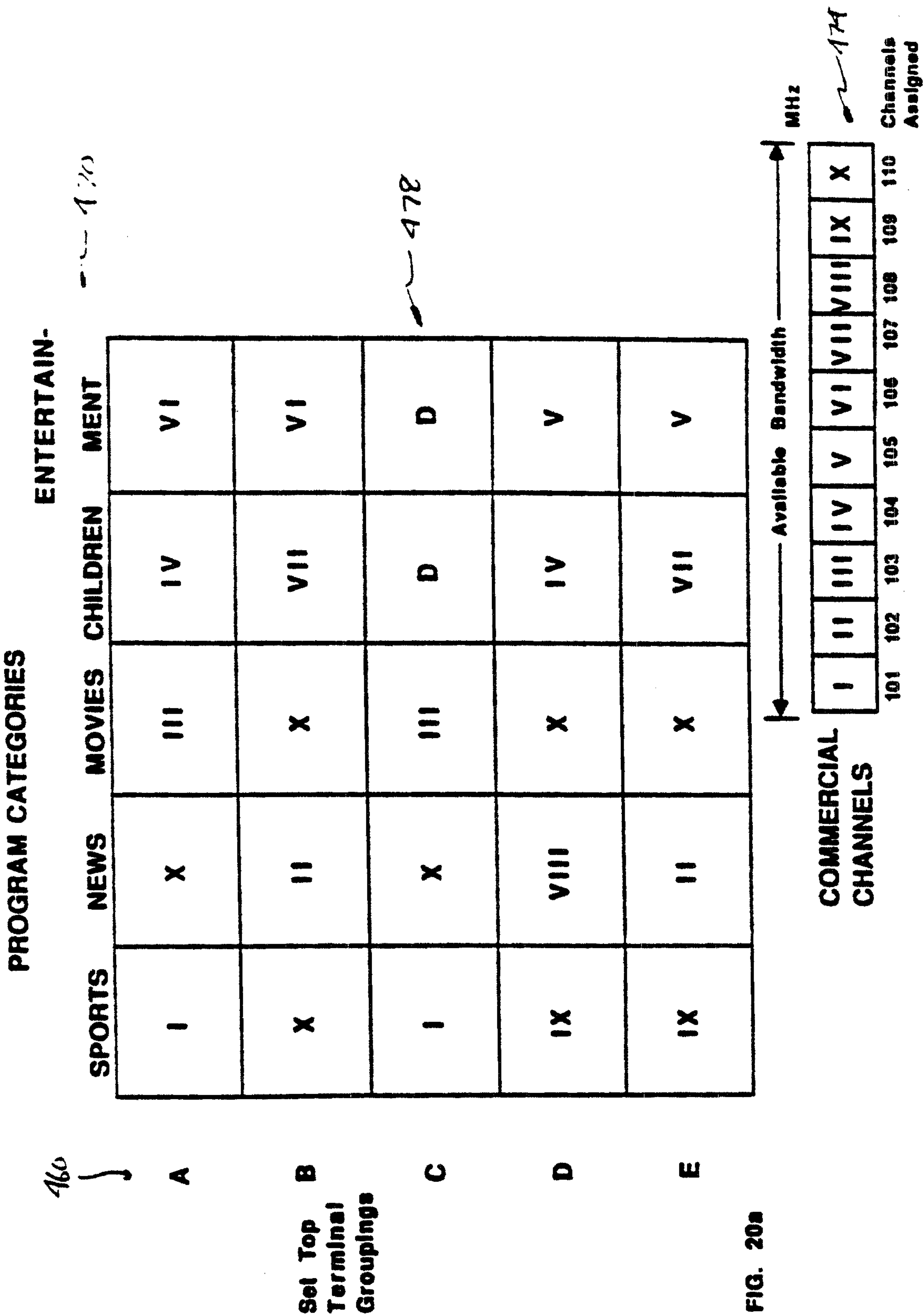


FIG. 19



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Set Top Terminal Groupings

FIG. 20a

FIG. 20b

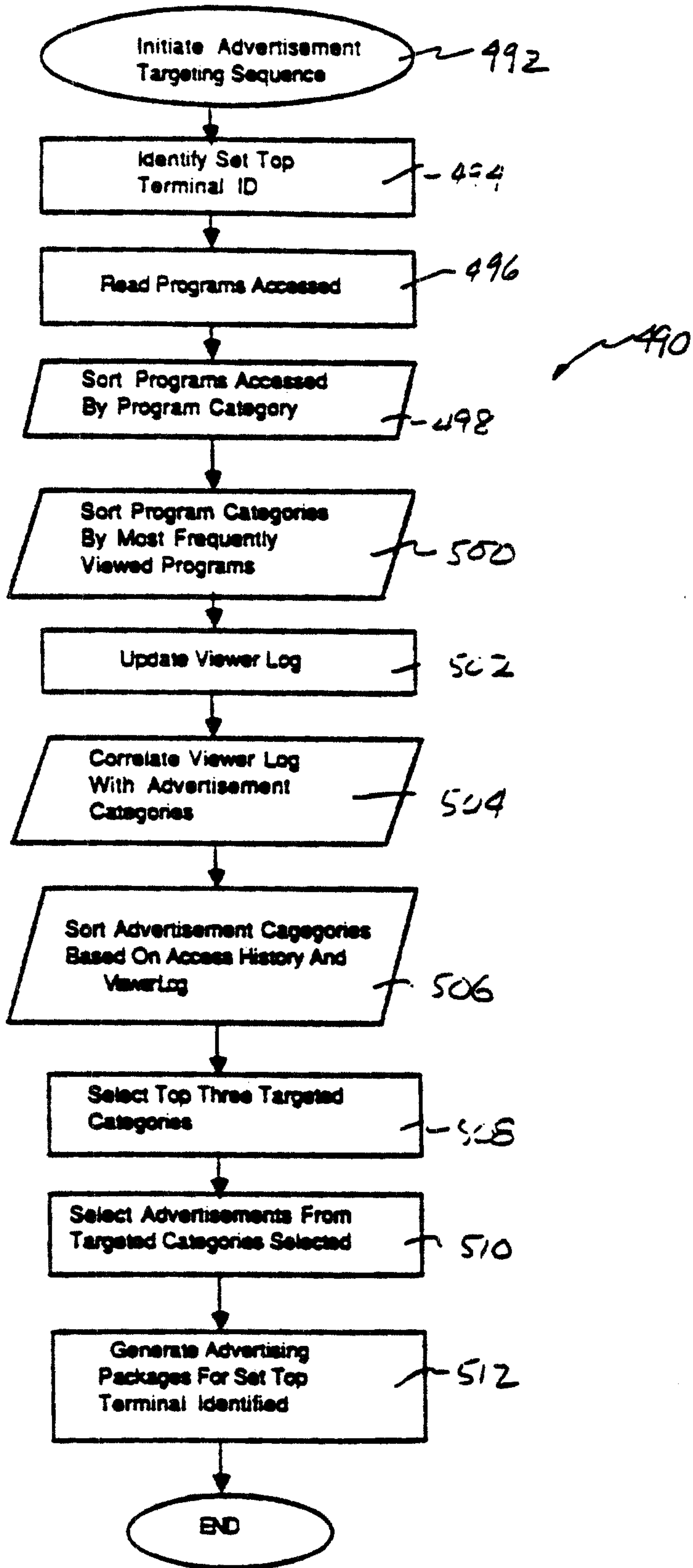


FIG. 21

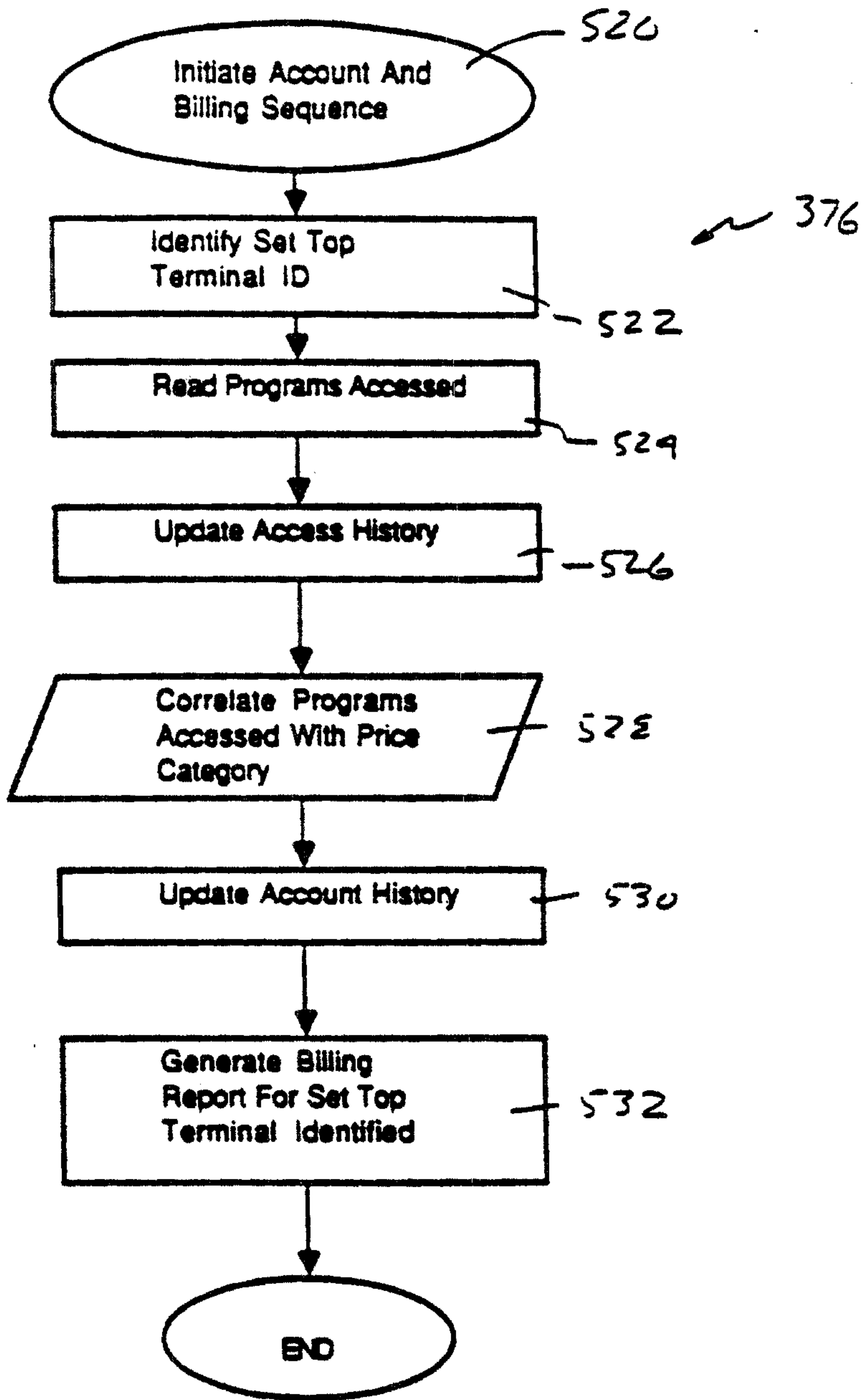


FIG. 22

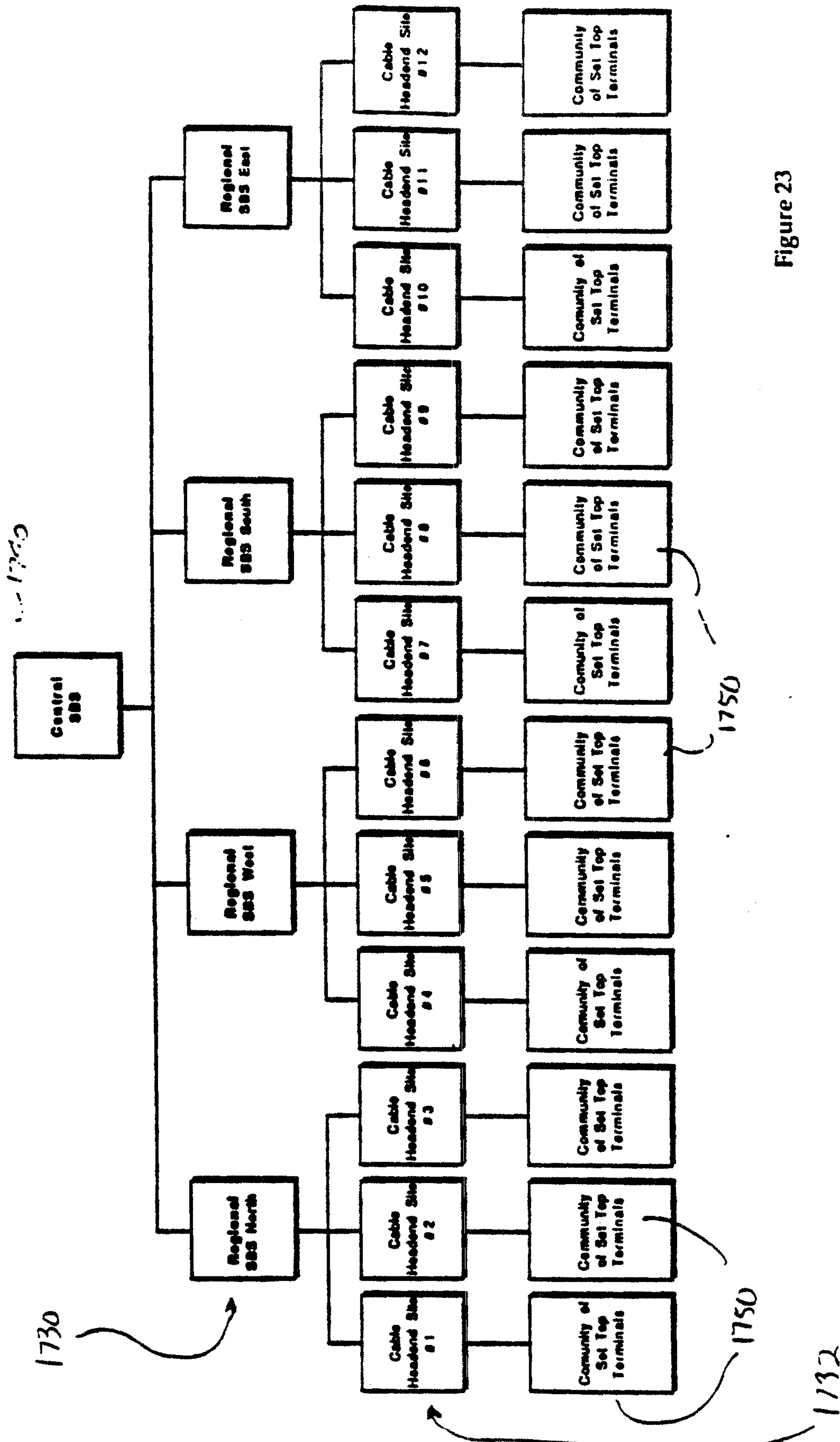


Figure 23

