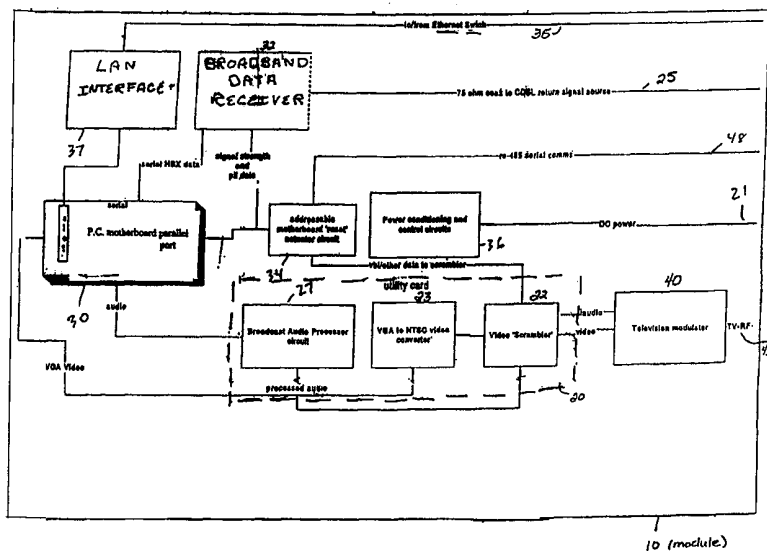




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US98/25997 (22) International Filing Date: 7 December 1998 (07.12.98)  (30) Priority Data: 60/067,990 9 December 1997 (09.12.97) US 09/188,733 9 November 1998 (09.11.98) US  (71) Applicant: ICTV, INC. [US/US]; 14600 Winchester Boulevard, Los Gatos, CA 95030 (US).  (72) Inventors: SNELL, Stephen, C.; 6312 Baseline Drive, Aptos, CA 95003 (US). DOYLE, John, F.; 510 Railway Avenue, Campbell, CA 95008 (US).  (74) Agents: SUNSTEIN, Bruce, D. et al.; Bromberg & Sunstein LLP, 125 Summer Street, Boston, MA 02110-01618 (US).		(81) Designated States: CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report.

(54) Title: MODULAR CONTROLLER AND MODULATOR SYSTEM FOR INTERACTIVE CABLE TELEVISION SYSTEM



## (57) Abstract

An interactive control module for use with an interactive cable television system. The module includes a frame having a television signal output, an interactive controller, a scrambled video provider and a modulator. The interactive controller is mounted to the frame. The scrambled video provider is also mounted to the frame and is connected to receive an information signal from said interactive controller. The scrambled video provider converts the information signal into a scrambled television signal. The modulator is mounted to the frame and is connected to receive the scrambled television signal so as to provide a modulated scrambled television signal to the television signal output.

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MODULAR CONTROLLER AND MODULATOR SYSTEM  
FOR INTERACTIVE CABLE TELEVISION SYSTEM

Field of Invention

5           This invention relates to cable television systems, particularly those providing private channels on demand to users for interactive-type services.

Background

          Bandwidth problems have long restricted the ability of cable television systems to provide private information services to subscribers. Such information services may  
10   include Internet access, video-on-demand, games, catalogs, etc. Private services may also include allowing the user to select from among hundreds of less popular programming that is thus made available only on a demand basis. One solution to the limits on system bandwidth has been to assign a portion of cable system bandwidth to conventional or popular channels that are universally broadcast to all subscribers. The  
15   remaining available channels are then available for assignment to requesting subscribers on a demand basis.

          One such system for providing interactive services on a demand basis is described in U.S. Patent No. 5,550,578. The full disclosure of this reference is hereby incorporated by reference herein. Basically the cable service distribution network  
20   divides the subscriber pool into various service areas, each served by a different trunk. A first group of channels broadcast to all service areas may provide conventional channels on channels 1 to 15 for example. A second group of channels, 16 to 40, for example, may be reserved for private information services. While the information on channels 1 to 15 is the same in each service area, the information on channels 16 to 40 is  
25   different in each service area. Of these channels, those that are in use are individually assigned to a requesting subscriber. A subscriber in one service area may be interacting on channel 16 at the same time a different subscriber in a different service area was also assigned to channel 16. The headend is equipped with the necessary processing, switching or splitting and combining systems for setting up these private channels on  
30   demand.

          U.S. Patent No. 5,550,578 proposes that the headend include a multitude of interactive controllers (or processors) and a multitude of scrambler-modulator cards.

The controllers are mounted in rows of cards supported in the rearward portion of a chassis. The scrambler-modulator cards are plugged into the forward portion of the chassis. A problem is presented when trying to efficiently and conveniently add or remove this equipment in response to the changing needs of the cable system. Numerous  
5 electrical connections need to be made for each card added. The repair and scaling of the equipment may also be difficult.

### Summary of the Invention

In a preferred embodiment, the present invention is directed to an interactive control module for use with an interactive cable television system. The interactive cable  
10 television system includes: (i) an information service network, for delivering information services to subscriber televisions, (ii) a plurality of home interface controllers, each home interface controller associated with a subscriber television and in data communication with the headend, and (iii) a plurality of subscriber selection devices, each such device associated with a home interface controller for permitting subscriber  
15 interaction. The interactive control module is mounted on a frame. On the frame is the headend equipment available for assignment to a subscriber television. An interactive controller, mounted on the frame, communicates with an assigned home interface controller and provides interactive service to the associated subscriber television.

A scrambled video provider unit, mounted on the frame, is in signal  
20 communication with the interactive controller. The scrambled video provider receives an information signal, typically in a computer monitor format such as VGA, from the interactive controller. The scrambled video provider converts the information signal to a television signal and scrambles the television signal. A modulator, also mounted on the frame, receives the scrambled television signal from the scrambled video provider. The  
25 modulator places the scrambled television signal on an assigned channel frequency and provides the scrambled television signal for delivery over the network to the subscriber television.

The interactive control module has a LAN interface with a data input providing the interactive control module with access to a multitude of information sources. A  
30 return control signal input receives data from the assigned home interface controller. In one embodiment, the return control signal input is connected to the cable television line. In another embodiment, the return control signal input is connected to a telephone line.

The scrambled television signal is provided over the cable network through a television signal output from the modulator.

The equipment to provide service to each subscriber on demand is located in one module. This module is easily removable from a rack for repair and scaling. Another  
5 advantage of the interactive control module is the limited number of cable connections that need to be made when adding one to a system to accommodate a higher subscriber usage rate.

Other objects and advantages of the invention will become apparent during the following description of the presently preferred embodiments of the invention taken in  
10 conjunction with the drawings.

#### Brief Description of the Drawings

FIG. 1 is an isometric view of an interactive control module of an embodiment of the invention.

FIG. 2 is a block diagram of the interactive control module of an embodiment of  
15 the invention.

FIG. 3 is a block diagram of the interactive control module of an alternate embodiment of the invention.

FIG. 4 is a schematic block diagram of a cable television system incorporating the interactive control module of FIGS. 1 or 2.

#### Detailed Description of the Embodiments

  
20

In FIG. 1, an embodiment of an interactive control module **10** is shown. It is contemplated that many of these interactive control modules **10** would be housed in one or more racks at a cable headend to make interactive service available over a cable television system on a demand basis. All of the electronics are mounted to a physical  
25 frame that can be easily inserted or removed from a rack. In the embodiment of FIG. 1, the physical frame includes a housing that encases the interactive control module **10**. A front panel **14** of the housing includes a handle **16** to facilitate pulling the module out from a rack. The front panel may further include manual controls such as a power switch **18** for affecting the operation of the electronics. The front panel **14** may further  
30 include vent holes **19** for help with cooling the electronics.

Referring now to FIG. 2, the interactive control module **10** has five external signal connections. One connection **21** provides the power to the electronics of the

module. A second connector **45** provides a television signal RF output for combining with other television signals and transmitting to the service area of the assigned subscriber television. A third connector **35** provides access over a local area network to information sources and interactive services or programs. A LAN interface **37** is  
5 included in the interactive control module to handle communications from the local area network. A presently preferred interface is a 10 base T (Ethernet) adapter card. An interactive controller **30** receives control information signals through a return signal input **25**. This delivers the control signals from the assigned home interface controller. In the embodiment of FIG. 2, these return signals are delivered over the cable of the  
10 cable distribution network and ultimately through a coax cable to the return signal input **25**. The interactive controller of this embodiment contains a broadband data receiver **32** in order to receive the signals from the assigned home interface controller. Finally, the module may be provided with a serial port such as an RS-485 serial communication port **48**.

15       The interactive controller **30** is located on a PC motherboard or plug-in module. The controller may be a computer processor, microprocessor, CPU or the like, such as a Pentium® processor made by Intel. A PC motherboard may include a slot for receiving the LAN interface card. A serial port on the motherboard receives the control signals from the assigned home interface controller. The motherboard delivers a VGA video  
20 output and an audio output.

      The outputs from the interactive controller **30** are passed to what is called herein a scrambled video provider unit **20**. A "scrambled video provider" produces a scrambled television signal. The scrambled television signal is provided to a television modulator **40** for placement on a channel frequency assigned for use by the assigned home interface  
25 controller. The modulator **40** may include an IF signal that is modulated by the scrambled television signal and an upconverter for raising the carrier to the assigned channel frequency. The scrambled video provider unit separately receives the audio in a broadcast audio processor circuit **27** and receives the VGA video at a VGA to NTSC video converter **23**. Other converters may be substituted to accommodate different  
30 standards such as a VGA to PAL converter for Europe. The processed audio and television signal are provided to a scrambler **22**. The scrambler **22** may be a complete conventional scrambler providing in addition to a scrambled television signal output, a

signal authorization for data transmission to the subscriber's set top to allow descrambling. Alternatively and preferably, the video scrambler **22** is a simplified scrambling unit that performs sync suppression to scramble the signal and is provided with a conditional access code (tag) for insertion into the scrambled signal. In such a system, a separate scrambler including an encrypter, an encoder and an interface to an access controller is provided at the headend for each channel frequency. The access controller sends the signal authorization to each home interface controller assigned to the channel frequency in any of the service areas. The signal authorization will typically include a key for decrypting the conditional access code. The encrypter encrypts the conditional access code. The encoder places the conditional access code into a scrambled reference video signal. An extractor in the separate scrambler for the given channel frequency removes the conditional access code from the reference and sends it to the serial port **48** of each interactive control module active at the given channel frequency. The interactive control module provides a path for the conditional access code into the video scrambler **22** where it is inserted into the scrambled signal. The conditional access code may be inserted into the vertical blanking interval (VBI) or the audio subcarrier depending upon the desired system design.

The interactive control module **10** may be further provided with an addressable motherboard reset actuator circuit **34**. This permits system management **113** to deliver a signal through serial communication path to the PC motherboard to cause the computer to execute a reset function. Power conditioning and control circuits **36** provide regulated power to the other circuits in the module. The module can be efficiently manufactured using a printed circuit board on which the scrambled video provider **20**, the reset actuator circuit **34** and the power conditioning circuit **36** are all mounted.

The interactive control module **10** advantageously provides in a single package all the headend hardware that is assignable on a demand basis to a requesting subscriber. The module includes the interactive controller **30**, the scrambled video provider **20** and the modulator **40**. As such, a cable headend can be easily scaled up or down to handle more or less interactive traffic.

FIG. 3 shows an alternative embodiment of the subscriber control module **10**. The return signal information from the subscriber television is received at the return signal input **26** via a telephone line. The interactive controller **30** contains a modem **33**

in order to receive the return signal information. In other respects, the interactive controller **30** is essentially the same as that illustrated in FIG. 2.

FIG. 4 shows a cable television system incorporating the interactive control modules **10** of FIGS. 1 to 3. The cable television system reuses a band of interactive channels for each of a plurality of service areas (A, B, C). In FIG. 4, the system is shown divided into a back end **11** and a front end **12**. In back end **11**, network interface **216** is in communication with an Internet service provider. Back end switches **112** make the Internet available to the interactive control modules **67a**, **67b**, **67c**. The Web and Application server processes **213** make web-browsing or other interactive processes like games, catalogs or other interactive information services available through the back end switches to the interactive controller. System management **113** supervises the switching and sets up connections between a requesting subscriber and an interactive controller **67**. System management **113** assigns interactive controller modules to requesting subscribers on a demand basis. Interactive channels whether they be entire analog channel frequency bands or time shared or packet addressed portions of a signal on a frequency band are also individually assigned to requesting subscribers. System management **113** can either make the assignment or make a list of available channels known to the home interface controllers so that they can select one from among those that are available when interactive service is requested through the associated subscriber selection device. Distribution data switches **121** connect the information sources including the Internet to the interactive control modules. Return path communications from a home interface controller to the headend may be directed through a telephone line or a cable return path depending upon the design of the particular cable system. The figure shows that alternative return paths include either telephone return path processing **212** or cable return path processing **211**. Return path switches **114** are controlled by system management **113** to connect the return signals with the assigned interactive controller. Home interface controllers may be housed in the set top or in a separate box. The home interface controller receives control signals from a subscriber selection device such as a TV remote, a keyboard, a joystick, etc. Such signals are sent upstream to interact with the assigned interactive controller. System management **113** confirms an assigned channel with the home interface controller so that the associated set top can be tuned to the appropriate frequency band.



A switcher combiner **73** takes the scrambled and modulated television signals from the interactive control modules and combines those directed to the same service area. The combined interactive signals are combined with signals that go to all service areas in a recombining network **78**. Such signals include conventional broadcast channels **72** and signal authorization information from the out of band transmitter used by the access controllers. The signal authorization information is individually addressed to its assigned subscriber for reading by the assigned set top. The set top, when tuned to a scrambled channel, will always be watching the out-of-band frequency on which the access controller is sending out the signal authorization information. The combined signals for each service area are transmitted over the service area's respective trunk.

Of course, it should be understood that various changes and modifications to the preferred embodiments described above will be apparent to those skilled in the art. For example, the size, shape and arrangement of the interactive control modules may be varied and still be fit on a single removable module. This and other changes can be made without departing from the spirit and scope of the inventions and without diminishing its attendant advantages. It is, therefore, intended that such changes and modifications be covered by the following claims.

What is claimed is:

1. An interactive control module for use with an interactive cable television system comprising:
  - a frame having a television signal output;
  - 5 an interactive controller mounted to said frame;
  - a scrambled video provider mounted to said frame and connected to receive an information signal from said interactive controller, said scrambled video provider converting the information signal into a scrambled television signal; and
  - a modulator mounted to said frame and connected to receive the scrambled
  - 10 television signal so as to provide a modulated scrambled television signal to the television signal output.
2. The interactive control module of claim 1, wherein the interactive controller contains a broadband data receiver coupled to the interactive controller for receiving
- 15 control information from a home interface controller of the interactive cable television system.
3. An interactive control module according to claim 2, wherein the scrambled video provider further comprises
  - 20 a video converter for converting the information signal into a television signal;
  - and
  - a video scrambler for scrambling the television signal creating a scrambled television signal.
- 25 4. The interactive control module of claim 2, wherein the interactive control module has multiple external signal connectors.
5. The interactive control module of claim 4, wherein one of the multiple external signal connectors is a local area network connector.
- 30 6. The interactive control module of claim 4, wherein one of the multiple external signal connectors is a communications port.

7. The interactive control module of claim 4, wherein one of the multiple external signal connectors is a return signal input for receiving control information from a subscriber television.
- 5 8. The interactive control module of claim 7, wherein the return signal input is connected to the broadband data receiver.
9. The interactive control module of claim 2, wherein the interactive controller is a computer processor.
- 10 10. The interactive control module of claim 5, further comprising a computer motherboard on which the interactive controller is connected.
11. The interactive control module of claim 10, wherein the computer motherboard  
15 includes a slot for receiving a local area network interface card.
12. The interactive control module of claim 11, further comprising a local area network interface card positioned in the slot and coupled to the local area network connector.
- 20 13. The interactive control module of claim 10, wherein the computer motherboard further comprises a video output and an audio output.
14. The interactive control module of claim 13, wherein the scrambled video  
25 provider further comprises:  
a broadcast audio processor circuit coupled to the audio output of the computer motherboard, the broadcast audio processor circuit converting an audio signal from the computer processor into a television audio signal.
- 30 15. The interactive control module of claim 10, further comprising an addressable motherboard reset actuator circuit coupled to the computer motherboard and coupled to a communications port.

16. The interactive control module of claim 2, wherein the television modulator further comprises an upconverter wherein the upconverter places the scrambled television signal on a carrier signal creating a modulated scrambled television signal.
- 5 17. The interactive control module of claim 1, further comprising a modem coupled between the interactive controller and a telephone line, the interactive control module receiving control information from a subscriber.
18. An interactive control module according to claim 17, wherein the scrambled  
10 video provider further comprises  
a video converter for converting the information signal into a television signal;  
and  
a video scrambler for scrambling the television signal creating a scrambled television signal.
- 15 19. The interactive control module of claim 17, wherein the interactive control module has multiple external signal connectors.
20. The interactive control module of claim 19, wherein one of the multiple external  
20 signal connectors is a local area network connector.
21. The interactive control module of claim 19, wherein one of the multiple external signal connectors is a communications port.
- 25 22. The interactive control module of claim 19, wherein one of the multiple external signal connectors is a return signal input for receiving control information from a subscriber television.
23. The interactive control module of claim 22, wherein the return signal input is  
30 connected to the modem and to the telephone line.

24. The interactive control module of claim 20, wherein the interactive controller is a computer processor.
25. The interactive control module of claim 24, further comprising a computer  
5 motherboard on which the computer processor is attached.
26. The interactive control module of claim 25, wherein the computer motherboard includes a slot for receiving a local area network interface card.
- 10 27. The interactive control module of claim 26, further comprising a local area network interface card positioned in the slot and coupled to the local area network connector.
28. The interactive control module of claim 25, wherein the computer motherboard  
15 further comprises a video output and an audio output.
29. The interactive control module of claim 28, wherein the scrambled video provider further comprises:  
a broadcast audio processor circuit coupled to the audio output of the computer  
20 motherboard, the broadcast audio processor circuit converting an audio signal from the computer processor into a television audio signal.
30. The interactive control module of claim 25, further comprising an addressable motherboard reset actuator circuit coupled to the computer motherboard and a  
25 communications port.
31. The interactive control module of claim 17, wherein the television modulator further comprises an upconverter wherein the upconverter places the scrambled television signal on a carrier signal.

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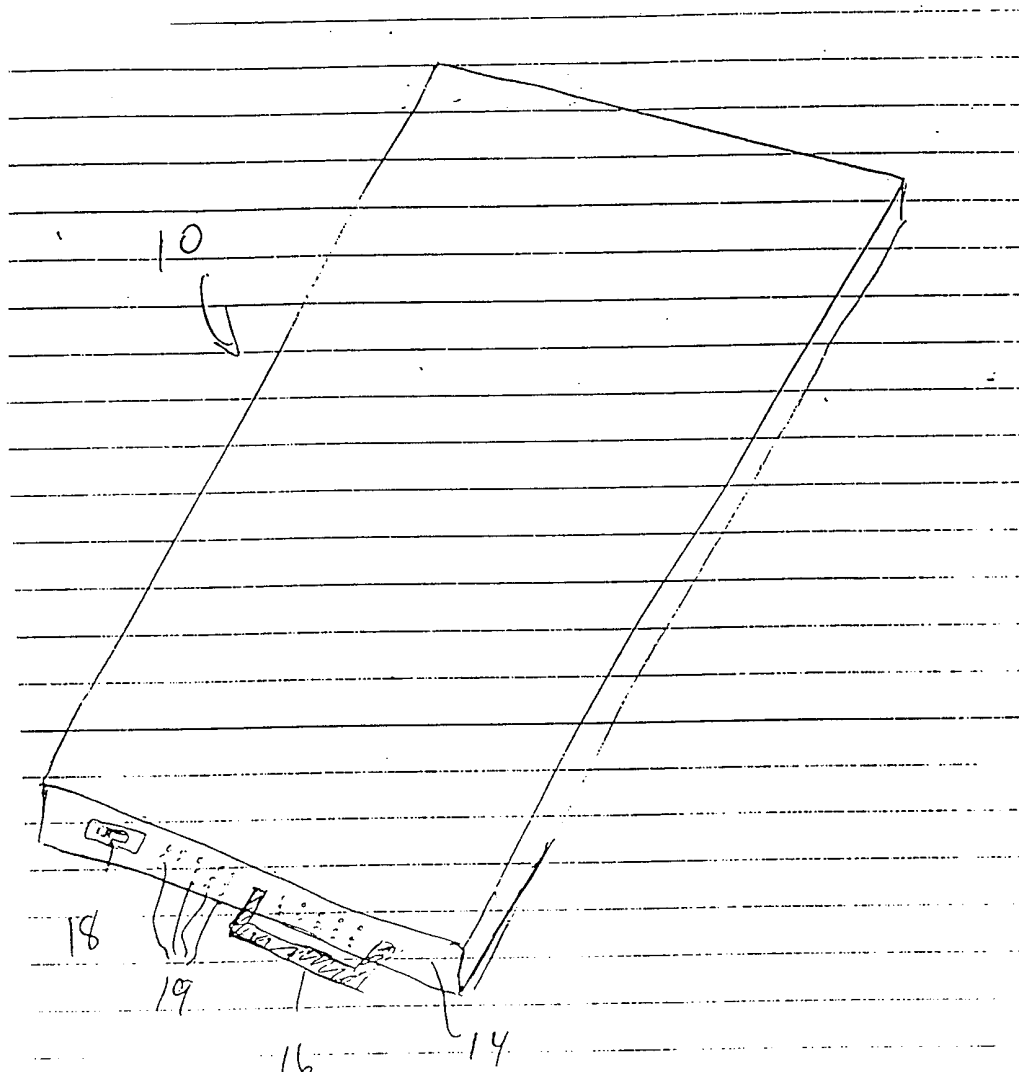


FIG. 1



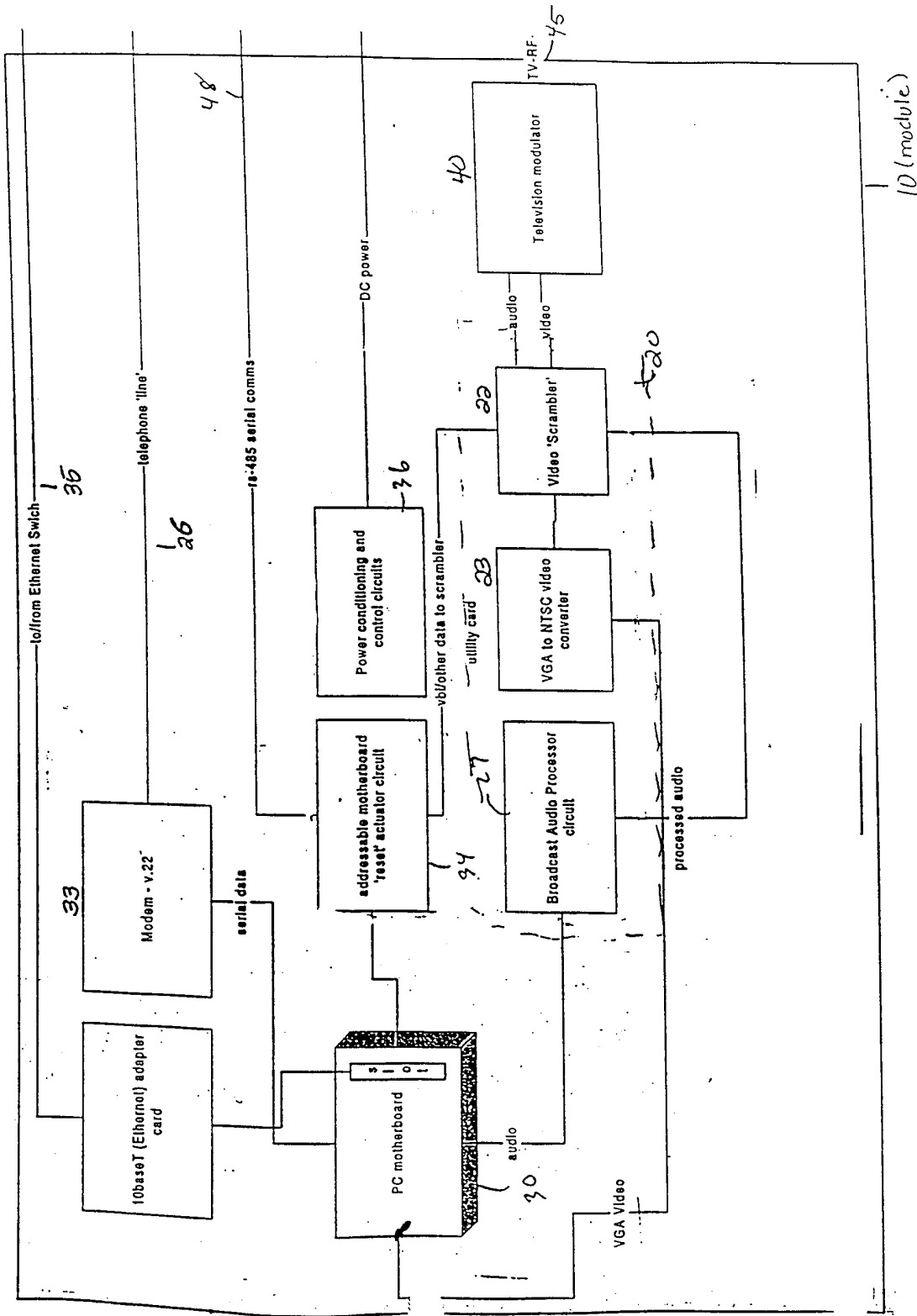


FIG 3



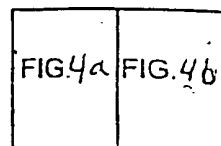
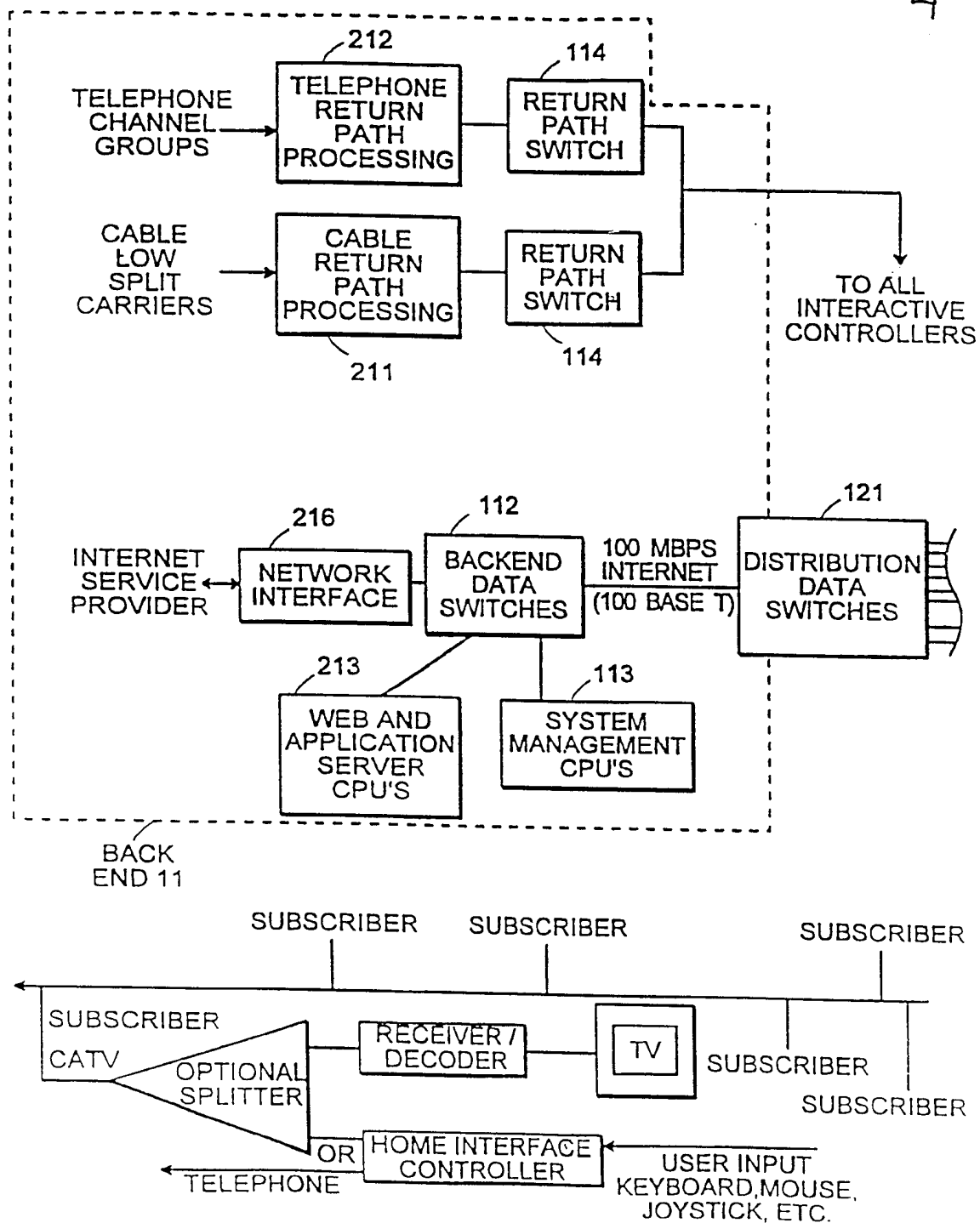


FIG. 4a

FIG. 4



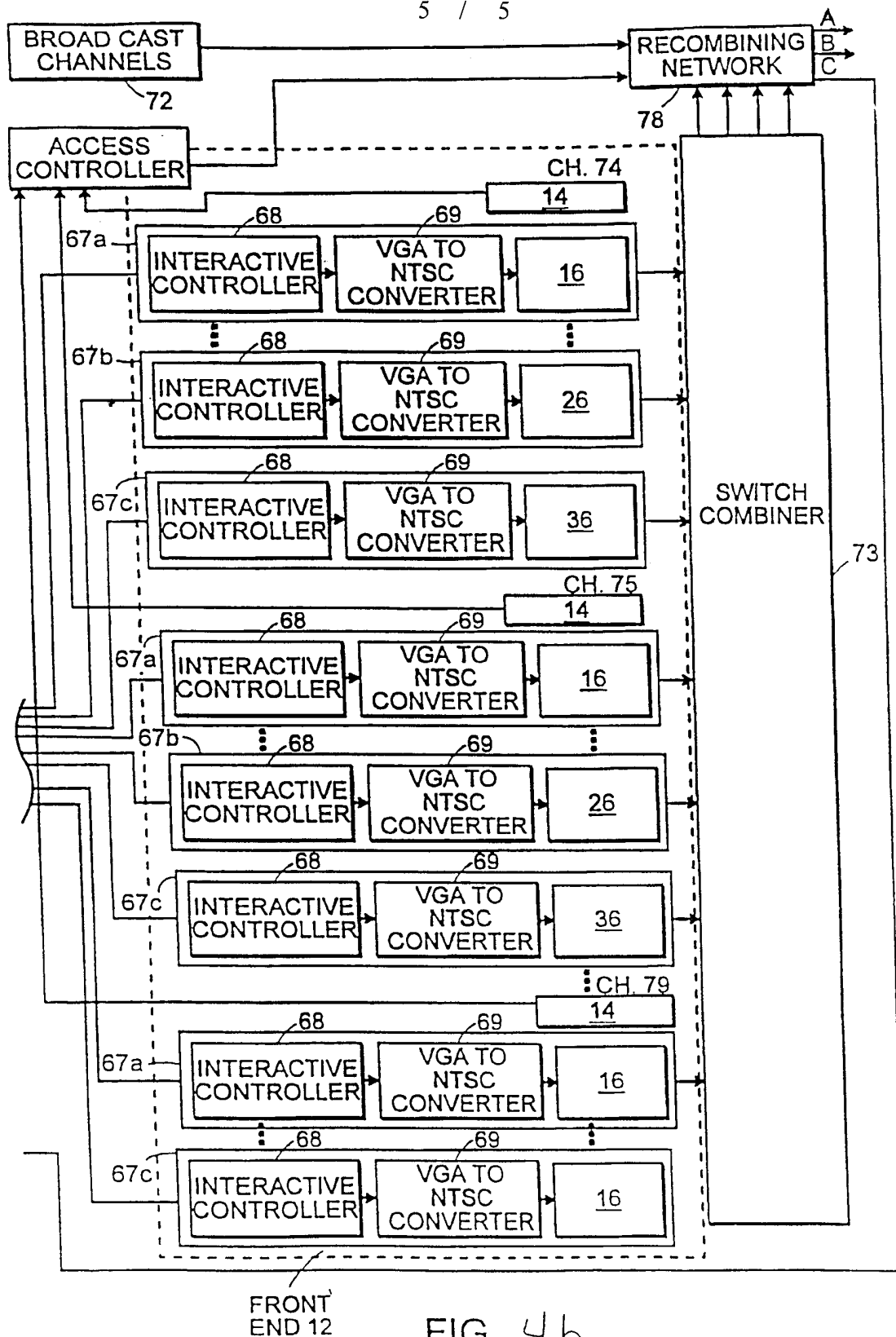


FIG. 4b

# INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/US 98/25997

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04N7/16 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 746 158 A (IBM) 4 December 1996  see column 5, line 14 - line 30 see column 8, line 43 - column 9, line 2 ---	1,2, 4-10,17, 19-25
A	US 5 631 693 A (FARMER JAMES O ET AL) 20 May 1997 see column 9, line 27 - line 40 see figure 3 ---	1-3,18
A	US 5 668 592 A (SPAULDING II JOHN E) 16 September 1997 see column 5, line 1 - line 33 see figure 2 -----	1,23

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

16 March 1999

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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