(54) Title: CENTRALIZED CABLE ACCESS CONTROL SYSTEM BY SATELLITE

(57) Abstract: A remote controller (116) remotely controls multiple remote cable headend systems (303A-303N) physically separated from it for controlling the distribution of audio and video cable programming. A satellite link (316) is used in the forward control data stream (302A-302N) to connect the controller to multiple remote headend sites (303A-303N). A low speed communication connection (304A-304N), such as frame relay (322A-322N), is used in a return path from the remote headend systems to the controller in order to support the required return connectivity for a closed-loop system. The controller receives IP acknowledgements and any other reverse control data in the return path (304A-304N) from the remote cable headend systems. The satellite link in the forward control data stream (302A-302N) can be the same satellite link used to transmit the video/audio data streams, constituting part of the video and audio programming, to the remote cable headend systems.
CENTRALIZED CABLE ACCESS CONTROL
SYSTEM BY SATELLITE

CROSS REFERENCE TO RELATED APPLICATIONS

This non-provisional U.S. Patent Application claims the benefit of U.S. Provisional Patent Application No. 60/166,051 entitled "CENTRALIZED CABLE ACCESS CONTROL SYSTEM BY SATELLITE" filed on November 17, 1999 by inventor Gregory Pasetta.

FIELD OF THE INVENTION

This invention relates to video broadcasting systems and more particularly to the centralized control of the transmission of digitized program material.

BACKGROUND OF THE INVENTION

Cable transmission media was introduced into homes in order to provide more program material over a greater number of carrier frequency channels than was otherwise available over the normal airwave frequencies of UHF and VHF. Cable transmission of television programs also provide less electromagnetic interference because the electromagnetic waves were contained within a coaxial cable. More recently, coaxial cable transmission media is being supplanted by fiber optic cable transmission media.

Originally, the signals provided over the cable transmission media were analog in nature. The analog signals on cable required greater bandwidth for transmission and were more susceptible to noise. Recently, the signals transmitted over cable transmission media have become digitized offering
even greater capacity than previously available on analog
systems and opening up a wider range of transmission
possibilities. The digital broadcasts are often refereed to
as digital video broadcasts (DVB) although the audio signals
and other audio only channels are digitized and transmitted
over cable systems as well.

The control of the cable transmission systems into homes
previously was local in nature. Typically, a local cable
company would provide service and programming for a given city
or a group of cities. This was to create the infrastructure
necessary to provide for routing cables into a user’s home.
Previously, the cabling and control of the cable transmission
was land based or terrestrial being localized in a given city
or group of cities although the programming to be broadcast
may be received by a cable operator by satellite. The system
used by a cable operator to locally route or transmit the
programming over the cable network into a user’s home is
referred to as a headend system. The system in a user’s home
to display the programming material is referred to as the
subscriber system.

Referring now to prior art Figure 1, a typical single
headend configuration is illustrated for the local
transmission of various programming material (content sources
- Digital, analog, satellite, broadcast, local, etc.) and
signals (QPSK, locally generated on a digital headend
interface (DHEI), OC-3, 8-VSB, DS 3, etc.) to the subscriber
system. A single cable headend system 100 is fed program
material - digital video/audio and audio alone - for
transmission down a cable 102 to subscribers who are equipped
with a suitable subscriber system 104. The subscriber system
104 may include digital receivers 106, or as they are commonly
referred to, digital set top units 106 and cable modems 108. A modern cable headend system 100 includes delivery components 110 for program delivery or transmission, delivery components 111 for data networking or transmission, and control components 112 for transmission control and network management. A typical stand-alone cable headend system is equipped with a control system having the following functions: (i) Download channel maps to the set top units which enable the units to tune to digital and analog channels; (ii) Authorize the set top units to decode and display pay per view events; (iii) Configure associated equipment; (iv) Download files to the set top units; and (v) Interface to business systems by which consumer orders are placed. Of the control components 112, particularly interesting are a Digital Addressable Controller (DAC) 116, such as General Instrument's DAC 6000, which performs high level control functions, a Network Interface Subsystem 118, such as General Instrument's Digital Access Network Interface Subsystem (DANIS), which converts the DAC's high level instructions to detailed machine level instructions, and a download server (DLS), such as General Instrument's DLS 1000 software, which accepts files from the DAC 116 and formats them for downloading to the set top units. The DLS can either reside within the DAC 116 or may be a separate stand-alone server. A key list server (KLS) 120 provides encryption and decryption keys for controlling the access to various programming materials. Data output from the DAC 116 for the receipt by the various Integrated Receiver Transcoders (IRT) 122 is used to configure them. The IRT's 122 receive the satellite program data and convert it into cable data. The KLS 120 delivers encryption keys to the DAC 116 for data encryption. The encryption process takes place in the various IRTs 122 when encrypting the program data
prior to conversion into cable transmission symbols. Additionally, the DAC 116 and the other devices of the headend system 100 deliver data to an out-of-band modulator (OM) 123 which aggregates and multiplexes together this data for input to the set top units 106. The components or equipment within the head-end system 100, such as the DAC 116, DANIS 118, any stand-alone DLS, KLS 120, integrated receiver transcoders (IRT) 122, modular processing system (MPS) 124, return path demodulator (RPD) 126 and the out-of-band modulator (OM) 123 are interconnected by the local Ethernet network 114, a local area network, which supports communications between all of these devices. Because the components of the typical head end system 100 are connected to the Ethernet network 114, there is no need to have them collocated together in one geographic location. Because of the Ethernet network 114, the components of the head end system 100 may be dispersed to different geographic locations having distributed control so long as there is a connection to the local Ethernet network 114.

An alternative to the typical headend system, referred to as HITS, was implemented by Headend In The Sky, a subsidiary of Tele-Communications, Inc. Prior art Figure 2 illustrates the HITS system 200. The HITS system 200 features a central control system 201 that uses a one-way satellite transmission path 202 to send a control stream to multiple remote cable headend systems such as headend system 203. The control stream comes from Galaxy 7 on k band and is multiplexed with HITS' program offering on one of Galaxy 7's transponders. The control stream is demodulated in the master IRT 204, and being in Ethernet compatible form, is placed on the local Ethernet network 206. Control stream information is delivered to the devices on the Ethernet network 206 such as the IRTs 208 and the out-of-band modulator (OM) 210. One disadvantage to the
control system used in the HITS system 200 is that internet
protocol (IP) acknowledgements are not returned from the
headend system 203 back to and received by the central control
system 201. That is, in HITS back channel connectivity for
IP acknowledgements is not extended to the central controller
of the central control system 201. Without the return of IP
acknowledgements, it is not clear whether all commands within
a control stream have been received properly such that
improper control in the cable head end system may result. It
is desirable to provide a new system of distributed control of
cable headend systems that provides for the return of IP
acknowledgements for improved control. Another disadvantage
to the control system of HITS is that it is not easily
expandable. The control system of HITS is a special design
requiring that it designed from the beginning to support a
maximum number of users. It is desirable to provide an
improved cable headend control system that is readily
expandable.

BRIEF SUMMARY OF THE INVENTION

Briefly, the present invention includes a method,
apparatus and system as described in the claims. The present
invention provides remote control of multiple headend systems
that can be physically separated from a controller. The
present invention uses a satellite link in the forward control
data stream to connect the controller to the multiple remote
headend sites. A low speed communication connection, such as
frame relay, is used in a return path from the remote headend
systems to the controller in order to support the required
return connectivity for a closed loop system. In this manner
the controller can receive IP acknowledgements and any other
reverse control data in the return path from the remote
headend systems. The satellite link for the forward control
data stream can be the same satellite link used to transmit
the video/audio data streams, constituting part of the video
and audio programming, to the remote cable headend systems.

BRIEF DESCRIPTIONS OF THE DRAWINGS

Figure 1 is a block diagram of a typical prior art cable
headend system.

Figure 2 is a block diagram of a prior art distributed
cable control system.

Figure 3 is a block diagram of the distributed cable
control system of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the following detailed description of the present
invention, numerous specific details are set forth in order to
provide a thorough understanding of the present invention.
However, it will be obvious to one skilled in the art that the
present invention may be practiced without these specific
details. In other instances well known methods, procedures,
components, and circuits have not been described in detail so
as not to unnecessarily obscure aspects of the present
invention.

The present invention provides remote control of multiple
headend systems that can be physically separated from the
controller, a digital addressable controller (DAC) 116. In
the preferred embodiment, the DAC 116 is General Instrument’s
DAC 6000 which has its capabilities extended by the present
invention in order to control multiple physically separate
headend systems. The present invention uses a satellite link
in the forward control data stream to connect the DAC 116 to
the multiple remote headend sites, and a low speed communication connection back to the DAC 116, such as frame relay, in order to support the return connectivity required by the DAC 116 to receive IP acknowledgements and any other reverse control data stream. The satellite link for control purposes can be the same satellite link used to transmit video/audio data streams, constituting part of the video and audio programming, to the cable headend systems.

Referring now to Figure 3, a block diagram of the digital audio/video broadcast and control system 300 of the present invention is illustrated. System 300 includes a centralized control network 301, one or more forward satellite links 302A-302N, one or more headend networks 303A-303N, and one or more reverse low bandwidth network connections 304A-304N such as a frame relay network connection. The centralized control network 301 includes the DAC 116, Ethernet hub 310, router 311, Ethernet hub 312, data formatter (DF) 313, and encoder 314. The forward satellite links 302A-302N include one or more transmit antennae 315 and associated transponders, one or more satellites 316, and one or more receive antennae 317A-317N and associated transponders. The one or more headend networks 303A-303N include digital satellite receivers 318A-318N, hubs 319A-319N, routers 320A-320N, hubs 321A-321N, and remote headend devices 350A-350N. The remote headend devices 350A-350N include components of the headend system 100 previously described with respect to Figure 1 including the DANIS 118, stand-alone DLS, integrated receiver transcoders (IRT) 122, modular processing system (MPS) 124, optional return path demodulator (RPD) 126 and the out-of-band modulator (OM) 123 which all can connect to the hubs 321A-321N by means of an Ethernet network. Certain devices of the remote headend devices 350A-350N couple to the cable medium.
102A-102N. The network connections 304A-304N can be any reverse network connection but preferably a low bandwidth network connection such as frame relay 322A-322N.

DAC 116 of the centralized control network 301 provides control data in Ethernet form (any later 2 protocol is applicable) onto the local area network of the centralized control network 301. The control data having an IP address for the data formatter 313 passes through the hub 310, router 311, hub 312 to the data formatter 313. The data formatter 313 encapsulates the control data in its Ethernet format into MPEG2 transport layer packets. The data formatter 313 is preferably a DF2000 data formatter from Intelligent Devices Inc. (IDI). The data formatter 313 provides the encapsulated form of the control data to the encoder 314. The encoder 314 can receive and encode other types of data including audio data or video data in a digital format such as MPEG2 and is preferably a multichannel encoder to do so. The multiple sources of data are multiplexed together into one encoded data stream. In the preferred embodiment, the encoder 314 is a DigiCipher II multichannel encoder by General Instrument (GI).

The encoder 314 preferably has a high speed input port - an isochronous port - which accepts MPEG2 data from other sources and multiplexes it with digital video created from other video inputs to the encoder. The encoder 314 can treat all input data streams the same. The input data stream can be encrypted for controlled access. The controlled access function is provided by other components within the uplink encoding system (not illustrated in Figure 3). While controlled access may be applied to the controlled data stream it is more typically applied to other data streams that contain entertainment programming. The entire multiplexed package of input data - digital audio, and/or digital video, and the control data
stream from the DAC 116 - is modulated onto a satellite carrier frequency, beamed to a satellite transponder and back down to the remote headends in the transponder’s downlink footprint, which typically encompasses the geographical region of the United States. The IP acknowledgements, required from the remote headend devices to satisfy the DAC 116, are sent back to the DAC 116 via network connections 304A-304N preferably of a low bandwidth such as frame relay.

Because the forward and reverse paths for the forward and reverse control data streams differ between the DAC 116 and the remote headend devices 350A-350N, the hubs 310, 312, 319A-319N, 321A-321N, and routers 311, 320A-320N provide for the forward transmission of Ethernet packets from the DAC 116 and the reverse transmission of IP acknowledgements from the remote headend devices 350A-350B and receipt by the DAC 116. In tracing the forward transmission of Ethernet packets, the Ethernet packet output from the DAC 116 is provided to the Ethernet hub 310. The Ethernet packets received at the hub 310 which are not to be directed to any local device, are to be routed from the DAC to their ultimate destinations at one of the remote headend devices 350A-350N. This is accomplished by the DAC forwarding the payload with the hardware address of its default gateway, router 311. Router 311 receives the Ethernet packets from the hub 310 at its Ethernet port "0" 323. Router 311 has an internet protocol (IP) routing table that causes the packets from the DAC to be delivered to its Ethernet port "1" 324, which is connected to hub 312. Ethernet hub 312 is used as a convenient interface to the DF 313. The DF 313 includes the functionality of a router. Ethernet packets sensed at the input of the DF 313 having hardware addresses of devices at the remote headend devices 350A-350N, are encapsulated into MPEG2 transport layer
packets. The data stream of MPEG2 transport layer packets, including any control data stream from the DAC 116, is input into the encoder 314, preferably into an isochronous port, where it is encrypted, if desired, and multiplexed with other video streams. The resultant data stream is modulated (QPSK modulation) onto a satellite carrier frequency forming a composite signal and uplinked via antennae 315 to one of the satellites 316A-316N. One of the receive antennae 317A-371N receives the composite signal at one of the sites of the remote headend networks 303A-303N.

At the remote headend networks 303A-303N receiving a composite signal, the composite signal is demodulated by the receiver 318A-318N which has previously been authorized to receive and decrypt (if needed) the MPEG2 stream which was formed from the DAC 116 control output data stream. The receivers 318A-318N are preferably a DSR 5200V receiver made by General Instrument. Receivers 318A-318N strip off the MPEG2 encapsulation and provide the Ethernet data contained therein originating from the DAC 116 at its output.

The receivers 318A-318N act similar to a message filter and filter messages such that only messages intended for the respective remote headend devices 350A-350N are output from the receivers to the respective hubs 319A-319N. The receivers 318A-318N, utilizing their respective router's proxy address resolution protocol (ARP), forward the Ethernet data payload to the hardware address of the respective router 320A-320N. As in the uplink, routers 320A-320N recognize these hardware addresses for them in their routing tables as being locally connected. Routers 320A-320N accept input data at its respective Ethernet port "0" 326A-326N and routes the data to its respective Ethernet hub 321A-321N via the respective
Ethernet port "1" 327A-327N. After leaving the respective one of the routers 320A-320N, the Ethernet control packets being properly addressed, are delivered to the appropriate devices of the remote headend devices 350A-350N.

In tracing the reverse transmission of Ethernet packets from the respective remote headend devices 350A-350N, including return Ethernet packets of IP acknowledgments, the return Ethernet packets for delivery to the DAC 116 are forwarded through the respective hubs 321A-321N to the respective router 320A-320N. The routers 320A-320N receive these return Ethernet packets at their respective Ethernet port "1" 327A-327N. Routers 320A-320N use their respective routing tables to forward the return packets out their wide area network interface card (WIC) ports 328A-328N to router 311 via the respective network connections 304A-304N. Preferably the network connections 304A-304N are frame relay network connections. Router 311 receives the return packets at its WIC port 325 and completes the return loop by forwarding the return packets out its Ethernet port "0" 323 through hub 311 to DAC 116. In this manner, the DAC 116 can receive IP acknowledgements and other return information from the remote headend devices 350A-350N.

Because of the structure of the control system of the present invention, expansion of control capacity is relatively easy by adding additional components (such as DAC 116, DF 313, and encoder 314) into the centralized control network 301.

If the capacity of the DAC 116, a General Instruments DAC 6000 in the preferred embodiment, and associated network becomes completely utilized, another control system and associated network can be formed by utilizing a second transponder and MPEG 2 encoder. All other components are
commercially available, such that another control system and
network can be readily synthesized.

Expansion of control capacity can be increased in an
alternate manner without utilizing an additional transponder.
In this alternate embodiment, a new control channel is set up
on the same transponder by allocating bandwidth formerly
reserved for video to the new control channel.

The preferred embodiments of the present invention are
thus described. While the present invention has been
described in particular embodiments, the present invention
should not be construed as limited by such embodiments, but
rather construed according to the claims that follow below.
CLAIMS

What is claimed is:

1. A control system for remotely controlling cable broadcasting, the control system comprising:
   a central control network including at least one central controller, the central control network for generating control data and multiplexing it with program material to form a composite signal;
   a satellite transmission system coupled to the central control network, the satellite transmission system for transmitting the composite signal between the central control network and a first remote cable headend system;
   the first remote cable headend system coupled to the satellite transmission system, the first remote cable headend system for receiving the composite signal and demultiplexing the control data from the composite signal and routing the control data to a headend device within the first remote cable headend system controlled by the central controller, the first remote cable headend system further for communicating all acknowledgements, including receipt of all control data by a headend device, and other return control information to the centralized controller; and
   a first return network connection coupled between the first remote cable headend system and the central control network, the return network connection for communicating all acknowledgements and other return control information from the first remote cable headend system to the central controller of the central control network to complete a control loop.

2. The control system of claim 1 wherein,
the first return network connection coupled between the first remote cable headend system and the central control network is a low cost low bandwidth network connection such as a frame relay connection.

3. The control system of claim 1 further comprising,
a second remote cable headend system coupled to the satellite transmission system, the second remote cable headend system for receiving the composite signal and demultiplexing the control data from the composite signal and routing the control data to a headend device within the second remote cable headend system controlled by the central controller, the second remote cable headend system further for communicating all acknowledgements, including receipt of all the control data by a headend device, and other return control information to the centralized controller; and

a second return network connection coupled between the second remote cable headend system and the central control network, the return network connection for communicating the acknowledgements and other return control information from the second remote cable headend system to the central controller of the central control network to complete a control loop.

4. The control system of claim 1 wherein,
the central control network is an Ethernet local area network and the control data is packetized into Ethernet packets including an address to deliver the control data to a headend device in the first remote cable headend system.

5. The control system of claim 4 wherein,
the central control network includes
a data formatter for encapsulating and
compressing the packetized control data into a motion pictures expert group (MPEG) 2 compressed format, and 
an encoder coupled to the data formatter, the 
encoder receiving the MPEG2 formatted packetized 
control data, multiplexing and encoding the MPEG2 
formatted packetized control data into the composite 
signal for transmission on the satellite transmission 
system.

6. The control system of claim 5 wherein, 
the first remote cable headend system includes 
a receiver for receiving the composite signal, 
demultiplexing and decoding, decapsulating and 
decompressing the composite signal into packetized 
control data.

7. The control system of claim 6 wherein, 
the first remote cable headend system includes 
a router for routing the packetized control data 
to the respective headend device in the first remote 
cable headend system to be controlled and routing the 
acknowledgements and other return control data over 
the first return network connection to the at least 
one central controller of the central control 
network.

8. The control system of claim 4 wherein, 
the central control network includes a router having an 
IP routing table for routing the Ethernet packets for 
transmission to a headend device in the first remote cable 
headend system.
9. The control system of claim 8 wherein, the router receives the acknowledgements and other return control information from the first remote cable headend system and routes it to the central controller of the central control network.

10. A centralized control system for controlling one or more remote cable headend systems of a cable broadcasting system, the centralized control system comprising:

   a central controller for controlling cable headend systems, the central controller being coupled to a local area network of control components;

   a first router coupling to the local area network of control components, the first router for routing packetized control data received from the central controller in response to the packetized control data having an IP address matching an address entry in an IP routing table;

   a data formatter for encapsulating and compressing the packetized control data into a motion pictures expert group (MPEG) 2 compressed format;

   an encoder coupled to the data formatter, the encoder receiving the MPEG2 formatted packetized control data, multiplexing and encoding the MPEG2 formatted packetized control data into a composite signal;

   a satellite transmission system coupled to the encoder, the satellite transmission system for transmitting the composite signal to a first remote cable headend system;

   the first remote cable headend system coupled to the satellite transmission system, the first remote cable headend system for receiving the composite signal, demultiplexing and decoding, decapsulating and decompressing the composite signal
into packetized control data and routing the packetized control data to the addressed headend device, the first remote cable headend system further for receiving IP acknowledgements indicating receipt of packetized control data by a headend device and other packetized return control data for communication to the centralized controller, the first remote cable headend system including a second router for routing the IP acknowledgements and other packetized return control data to the centralized controller;

a first return network connection coupled between the second router of the first remote cable headend system and the first router for communicating the IP acknowledgements and other packetized return control data there between; and

the first router communicating the IP acknowledgements and other packetized return control data to the addressed centralized controller to complete the control loop.

11. The centralized control system of claim 10 wherein, the first remote cable headend system includes a receiver for receiving the composite signal, demultiplexing and decoding, decapsulating and decompressing the composite signal into packetized control data.

12. The centralized control system of claim 11 wherein, the first remote cable headend system further includes a first hub and a second hub for communicating the packetized control data between devices connected to the first and second hubs.

13. The centralized control system of claim 10 wherein, a first hub is coupled between the central controller and the first router and a second hub is coupled between the first
router and the data formatter for communicating the packetized control data between devices connected to the first and second hubs.

14. The centralized control system of claim 10 wherein, the first return network connection coupled between the second router of the first remote cable headend system and the first router is a low cost low bandwidth network connection such as a frame relay connection.

15. The centralized control system of claim 10 further comprising,

a second remote cable headend system coupled to the satellite transmission system, the second remote cable headend system for receiving the composite signal, demultiplexing and decoding, decapsulating and decompressing the composite signal into packetized control data and routing the packetized control data to the addressed headend device, the second remote cable headend system further for receiving IP acknowledgements indicating receipt of packetized control data by a headend device and other packetized return control data for communication to the centralized controller, the second remote cable headend system including a third router for routing the IP acknowledgements and other packetized return control data to the centralized controller;

a second return network connection coupled between the third router of the second remote cable headend system and the first router for communicating the IP acknowledgements and other packetized return control data there between; and

the first router communicating the IP acknowledgements and other packetized return control data received from the second return network to the addressed centralized controller
to complete a control loop with the second remote cable headend system.

16. A method of providing remote centralized control of remote cable headend systems to remotely control cable broadcasting over cable media, the method comprising:

providing a central control network including at least one central controller, the central control network generating control data and multiplexing it with program material to form a composite signal;

transmitting the composite signal over a satellite transmission system to at least one remote cable headend system;

receiving and demultiplexing the composite signal at the at least one remote cable headend system to form the control data;

routing the control data to a headend device within the first remote cable headend system to be controlled by the at least one central controller,

generating an acknowledgement indicating receipt of control data by a headend device; and

transmitting the acknowledgement over a return network connection coupled between the first remote cable headend system and the central control network to complete a control loop between the central controller and a headend device within the first remote cable headend system to be controlled.

17. The method of claim 16 of providing remote centralized control of remote cable headend systems to remotely control cable broadcasting over cable media, the method further comprising:

receiving and demultiplexing the composite signal at
another remote cable headend system to form the control data;
	routing the control data to another headend device within
the another remote cable headend system to be controlled by
the at least one central controller,

generating an another acknowledgement indicating receipt
of control data by the another headend device; and

transmitting the another acknowledgement over another
return network connection coupled between the another remote
cable headend system and the central control network to
complete a control loop between the central controller and the
another headend device within the another remote cable headend
system to be controlled.
FIG. 1
(PRIOR ART)
FIG. 2
(PRIOR ART)
International application No.
PCT/US00/31842

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : H04N 7/20, H04N 7/173
US CL : Please See Extra Sheet.
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)
U.S. : 725/63, 64, 65, 116, 118, 121.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
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<tbody>
<tr>
<td>X</td>
<td>US 5,600,364 A (HENDRICKS et al.) 04 February 1997, col. 3, line 44 to col. 5, line 50.</td>
<td>1-17</td>
</tr>
<tr>
<td>X</td>
<td>US 5,600,573 A (HENDRICKS et al.) 04 February 1997, col. 3, line 15 to col. 5, line 15.</td>
<td>10-17.</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

Date of the actual completion of the international search: 17 JANUARY 2001
Date of mailing of the international search report: 21 MAR 2001

Name and mailing address of the ISA/US
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Form PCT/ISA/210 (second sheet) (July 1998)
A. CLASSIFICATION OF SUBJECT MATTER:
US CL :
725/63, 64, 65, 116, 118, 121.

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):
EAST.
Search terms: remote cable headend, server, control network, satellite transmission, return path, network connection, and central control network.