time at which the particular program will be received by a first receiving means (16, 114); and

storing the entered information.

9. The method of claim 8, further comprising the steps of:

sending the stored uniform resource locators at the time at which the particular program will be received by the first receiving means (16, 114), directly over an Internet connection (94) to a second receiving means (106).

10. A system for presenting integrated television programming and corresponding related Internet information segments obtained from Web sites on the Internet (20), the system comprising:

a television broadcaster data entry and broadcast means comprising:

a means (70, 74) for accessing a service Web site (62) on the Internet (20), wherein a member broadcaster of television programming accesses the service Web site (62);

a means (70, 74) for entering information into the service Web site (62), wherein the entered information is comprised of uniform resource locators and a time at which a particular program will be broadcast (86) by the member broadcaster (66), wherein the uniform resource locators specify one or more Internet addresses (102) of the relevant Internet information pages which relate specifically to the content of the particular program being broadcast

by the member broadcaster (66);

a means (70), connected to the entering means (70, 74), for storing the entered information;

a first means (86,110) for sending the particular program being broadcast by the member broadcaster (66) to a user (118), wherein the particular program contains a video signal and an audio signal;

a second means (74), connected to the storing means (70), for sending, at the time at which the particular program will be broadcast, the stored uniform resource locators over a direct Internet connection (94) to the user (118);

a user terminal (16) comprising:

a first means (16, 114) for receiving, from the first sending means (86, 110), the particular program, including the video and audio signals, being broadcast by the member broadcaster (66) to a user (118);

a second means (106) for receiving, from the second means (74) for sending, the stored uniform resource locators which correspond to the video and audio signals received by the first receiving means (16, 114);

a controller means (16), connected to the second receiving means (106), comprising:

a means (12) for decoding the uniform resource locators to determine the specified Internet addresses;

a means (98), connected to the decoding means (12), for

retrieving the one or more Internet information segments residing at the determined Internet addresses (102); and

a display means (18, 114), connected to the controller (16) and the first and second receiving means (16, 106, 114), for presenting the video and audio signals concurrently with the Internet information segments.

FIG. 1

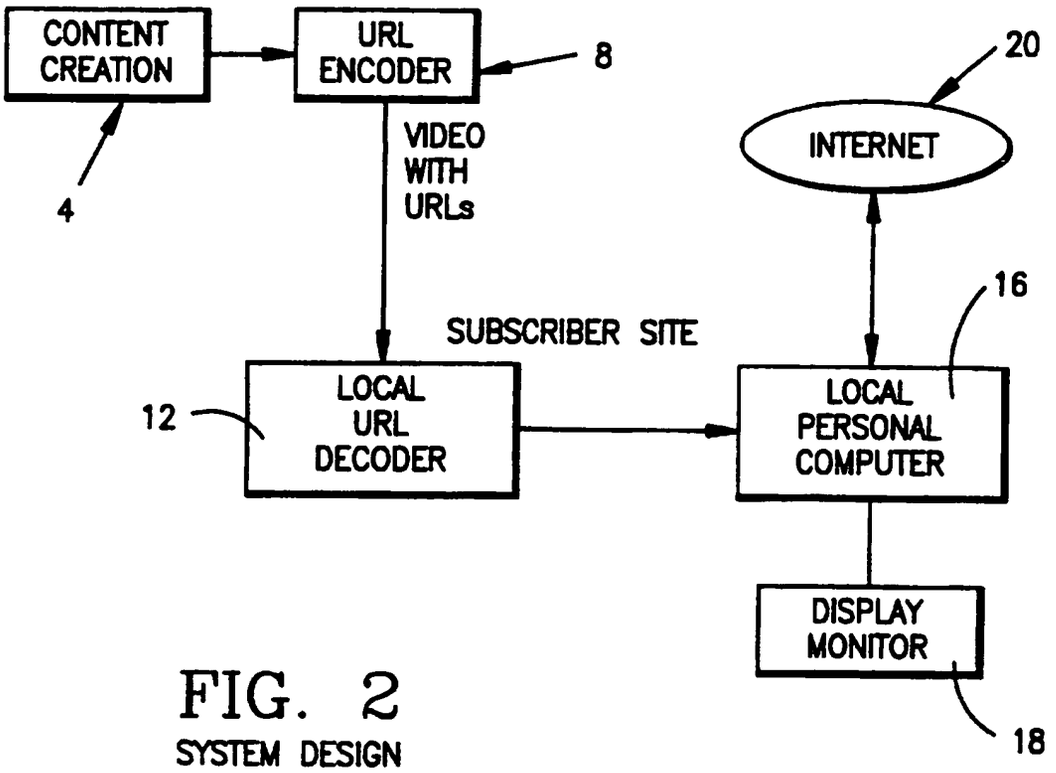
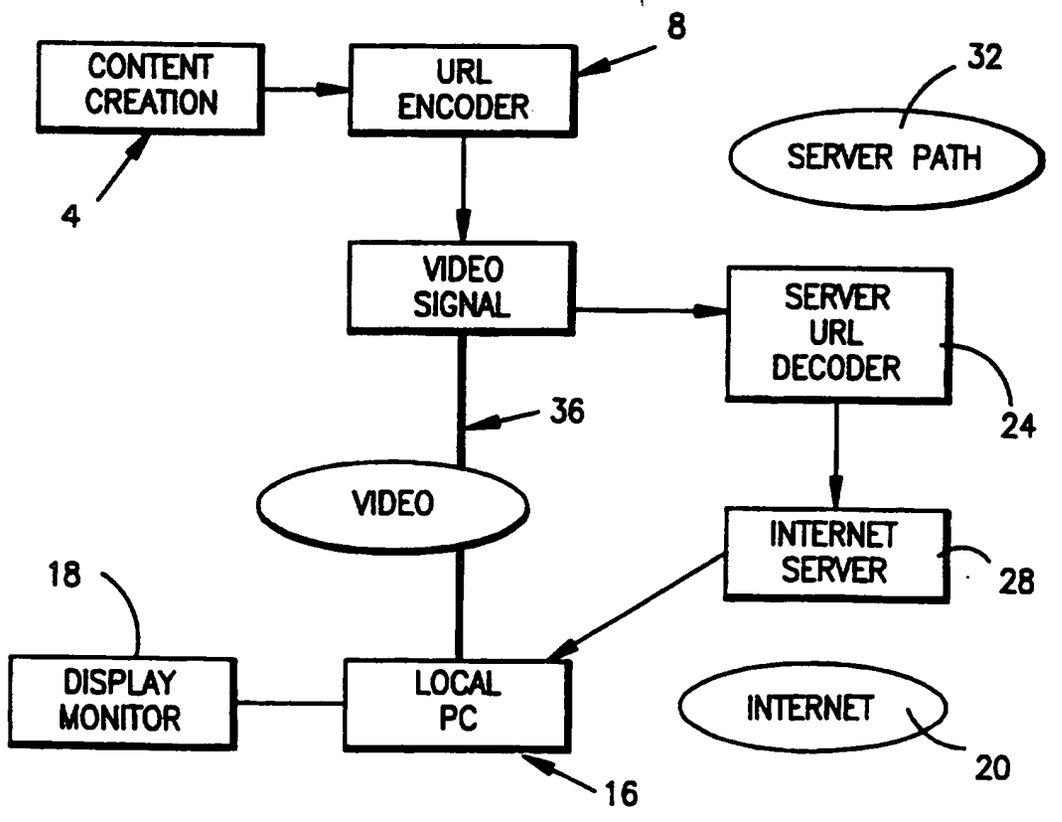
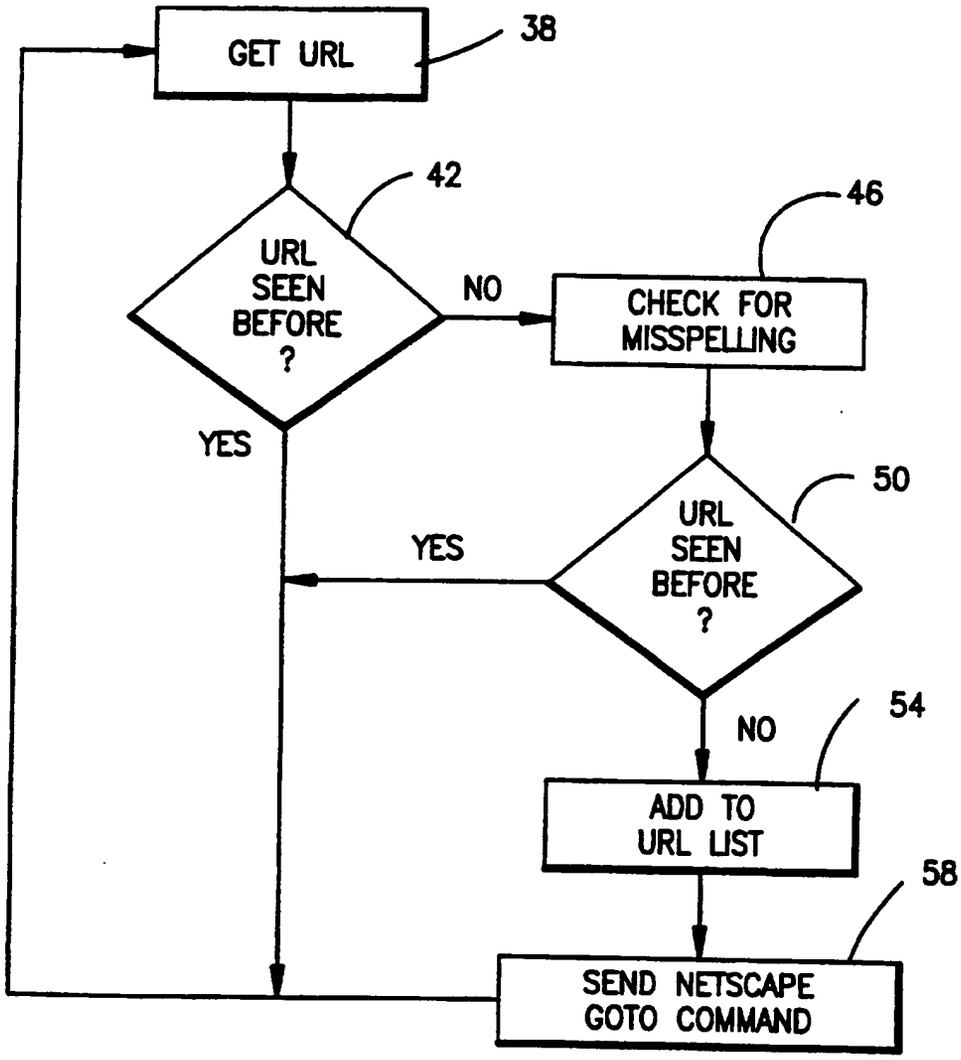


FIG. 2
SYSTEM DESIGN

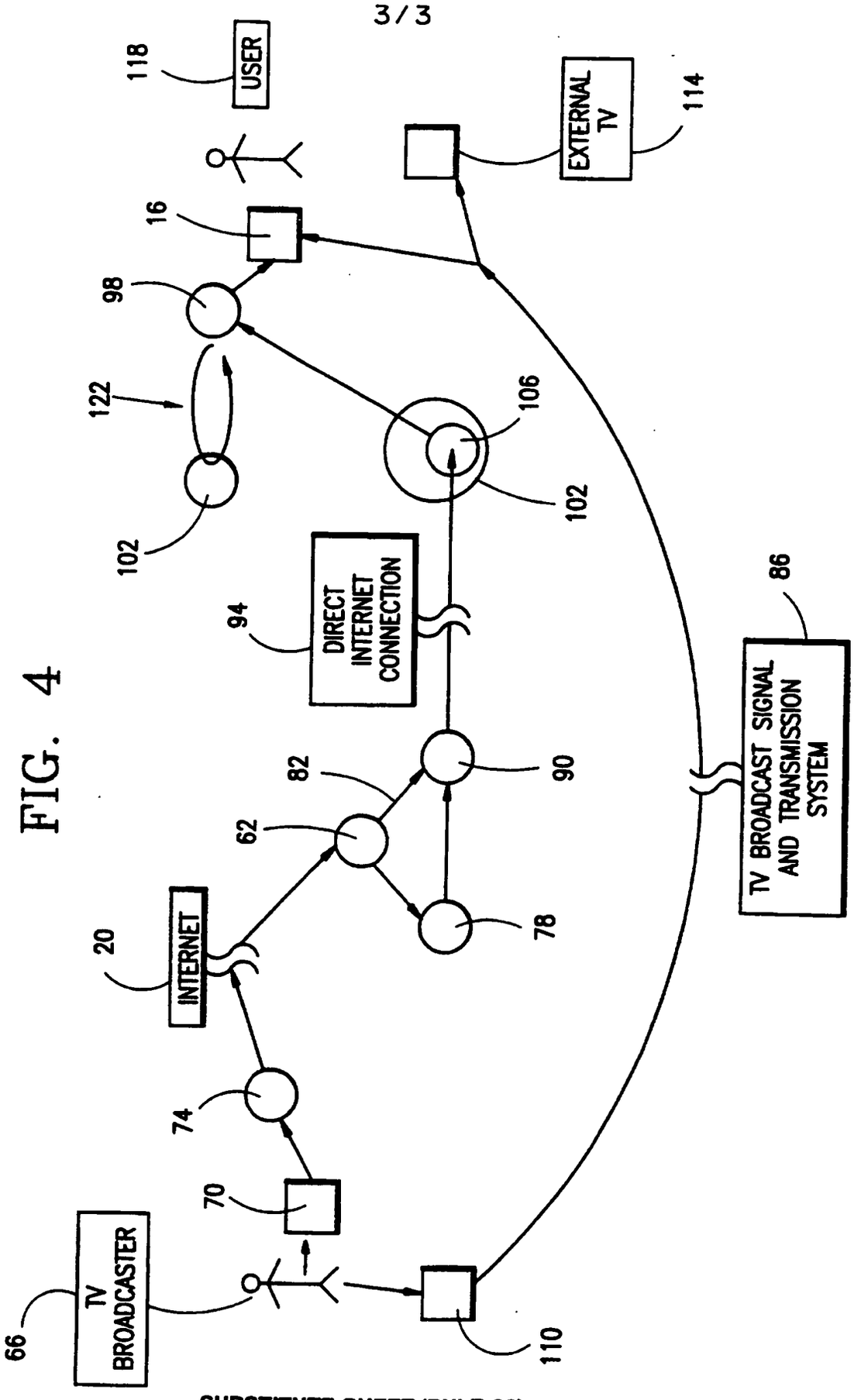




SOFTWARE DESIGN

FIG. 3

FIG. 4


USER
118
EXTERNAL TV
114
16
98
122
102
106
102
DIRECT INTERNET CONNECTION
94
86
TV BROADCAST SIGNAL AND TRANSMISSION SYSTEM
82
62
90
78
20
INTERNET
74
70
TV BROADCASTER
66
110

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/03525

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04N 7/00; H04L 12/00
US CL :395/200.01, 200.02; 348/7, 906
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)

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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 practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US, 5,589,892 A (KNEE ET AL) 31 DECEMBER 1996, cols 4-6.	1-9
A,P	US, 5,534,913 A (MAJETI AL) 09 JULY 1996, cols 1-3.	1-10
A	US, 5,481,542 A (LOGSTON ET AL) 02 JANUARY 1996, abstract.	1-10
Y	US, 5,479,268 A (YOUNG ET AL) 26 DECEMBER 1995, cols 1-3.	1-9
Y	US, 5,014,125 A (POCOCK ET AL) 07 MAY 1991, cols 1-2.	1-9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 25 APRIL 1997	Date of mailing of the international search report 24 JUN 1997
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(54) Method and apparatus for replacing stuffing bits with supplementary data in an MPEG video data stream

(57) An apparatus and method, applicable to variable bit rate video and constant bit rate video, is disclosed for replacing "stuffing bytes" with private data. The invention takes advantage of the otherwise wasted resources dedicated to "stuffing" in a data stream in order to insert private data. This is accomplished by inserting useful private data in a Transport Stream instead of the stuffing bits. That is, effectively, a re-multiplexing operation occurs where, based on the existence of certain conditions in a Transport Packet (e.g., stuffing bytes exist), the information necessary to replace stuffing bytes with private data yet still comply with established standards is accomplished. This data generally is referred to as privatestuff data in order to distinguish it from typical private data which may otherwise be encoded into a Transport Stream. The stuffing bytes removed from the Transport Packet may come from an adaptation field in the Transport Header or directly from the Transport Payload or both.

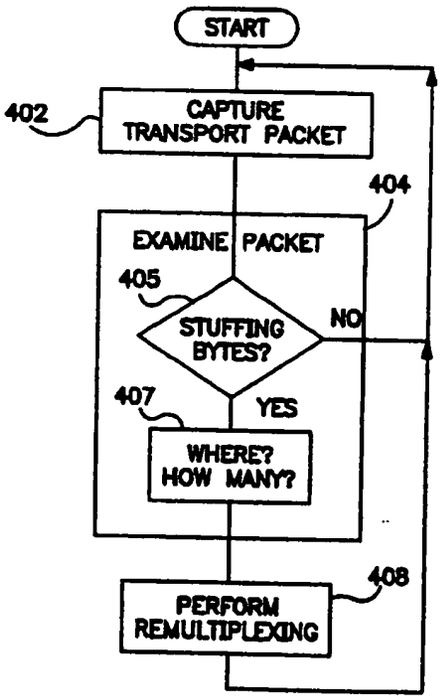

FIG. 4A

EP 0 805 598 A1

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Description

FIELD OF THE INVENTION

The present invention relates generally to data storage and transmission using MPEG standards and, more particularly, the present invention relates to the established standards of transmitting "private data" and "stuffing bytes" in a Transport Data Stream complying with MPEG standards.

BACKGROUND OF THE INVENTION

High Definition Television (HDTV) continues to make progress in its attempts to replace conventional television. Paving the way for this progress are various companies and associations working on standards to provide for a global market for HDTV.

One such group of companies is known as the "Digital HDTV Grand Alliance" including members such as AT&T, David Sarnoff Research Center, Massachusetts Institute of Technology and others. A comprehensive overview of the strides made by this group are presented in an article by Robert Hopkins entitled "Digital Terrestrial HDTV for North America: The Grand Alliance HDTV System" published in the IEEE Transactions on Consumer Electronics (Summer 1994). This article is herein incorporated by reference for all of its teachings regarding the background and basics of HDTV systems including the use of Program and Transport Packet Streams.

In addition to the Grand Alliance, much effort has been expended by the Moving Pictures Expert Group (MPEG), a committee within the International Standards Organization (ISO), in attempts to establish various standards for the storage and transmission of HDTV data (e.g., MPEG-2 standards - formats for Transport Packet Streams). Accepted standards are periodically published such as the Video Section of Information Technology - Generic Coding of Moving Pictures and Associated Audio ISO/IEC 13818-2 (November 1994) (hereinafter "Video Section") and the Systems Section of Information Technology - Generic Coding of Moving Pictures and Associated Audio ISO/IEC 13818-1 (November 1994) (hereinafter "Systems Section") both of which are herein incorporated by reference for their teachings regarding established standards and formats including "stuffing" techniques.

The syntax for the MPEG-2 standard defines several layers of data records which are used to convey both audio and video data. For the sake of simplicity, the decoding of the audio data is not described herein. Encoded data which describes a particular video sequence is represented in several nested layers, the Sequence layer, the Group of Pictures layer, the Picture layer, the Slice layer and the Macroblock layer. To aid in transmitting this information, a digital data stream representing multiple video sequences is divided into several smaller units and each of these units is encapsulated into a respective packetized elementary stream (PES) packet. For transmission, each PES packet is divided, in turn, among a plurality of fixed-length Transport Packets. Each Transport Packet contains data relating to only one PES packet. The Transport Packet also includes a header which holds control information, sometimes including an adaptation field, to be used in decoding the transport packet.

When an MPEG-2 encoded image is received, a transport decoder decodes the Transport Packets to reassemble the PES packets. The PES packets, in turn, are decoded to reassemble the MPEG-2 bit-stream which represents the image in the layered records, as described above. A given transport data stream may simultaneously convey multiple image sequences, for example as interleaved transport packets. This flexibility also allows the transmitter to switch among formats providing material in 4 by 3 aspect ratio according to one standard and widescreen (16 by 9) material according to another standard.

Turning to a system implementation for delivering HDTV using MPEG-2 standards to the consumer, in general, as illustrated in high-level block diagram of Figure 1, on the transmission side, video and audio signals are input to respective encoders 110 and 112, buffered in buffers 114 and 116, delivered to the system coder/multiplexer 118, and stored in storage unit 120 or transmitted by transmitter unit 120. On the receiving side, the signals are received by a system decoder/demultiplexer 122, again buffered in buffers 124 and 126, then decoded by decoders 128 and 130 and output as the original video and audio signals.

An important aspect of the illustration of Figure 1 is that, although the intermediate stage buffering of the signals includes a variable delay, the overall delay from input to output of the signals is required to be substantially constant. This is accomplished by monitored flow control and buffers.

As indicated in Figure 1, the delay from the input to the encoder to the output or presentation from the decoder is constant in this model, while the delay through each of the encoder and decoder buffers is variable. Not only is the delay through each of these buffers variable within the path of one elementary stream, the individual buffer delays in the video and audio paths differ as well. Therefore, the relative location of coded bits representing audio or video in the combined stream does not indicate synchronization information. The relative location of coded audio and video is constrained only by a System Target Decoder (STD) model such that the decoder buffers must behave properly; therefore, coded audio and video that represent sound and pictures that are to be presented simultaneously may be separated in time within the coded bit system by as much as one second, which is the maximum decoder buffer delay that is allowed in the STD

model. Similar to the STD model is a Video Buffering Verifier (VBV) which, as stated in the Video Section:

> Constant rate coded video bitstreams shall meet constraints imposed through a Video Buffering Verifier (VBV) defined in this clause....
>
> The VBV is a hypothetical decoder, which is conceptually connected to the output of an encoder...Coded data is removed from the buffer as defined below. It is required that a bitstream that conforms to this specification shall not cause the VBV to overflow. When low_delay equals 0, the bitstream shall not cause the VBV buffer to underflow...

A high-level illustration of an exemplary STD model operating in conjuntion with an encoder is shown in Figure 2.

The requirement that the VBV buffer or STD model decoders not underflow is very important as product quality is at stake. In order to maintain constant bitrate video, "stuffing" is implemented within various aspects of the system. "Stuffing" is the act of filling the data stream with "don't care" information simply to maintain the required bit-rate.

For Transport Stream packets carrying PES packets, stuffing is used when there is insufficient PES packet data to fill the Transport Stream packet payload bytes to a level that would support the transmitted data rate.

Stuffing, for example, can be accomplished by defining an adaptation field longer than the sum of the lengths of the data elements in it, so that the payload bytes remaining after the adaptation field exactly accommodates the available PES packet data. The extra space in the adaptation field and/or payload can be filled with stuffing bytes.

Figure 3 shows the format and field locations for a Transport Packet Stream where each Transport Packet includes a Header and a Payload. The header of a Transport Packet includes fields for indicating the existence and controlling the length and content of an adaptation field. Within that adaptation field, another field is designated as "stuffing bytes". Stuffing bytes are similarly used in the payload of the Transport Packets.

As mentioned, however, using stuffing bytes, which typically comprise all logical one values (i.e., "11111111") in the Transport Header and all logical zero values (i.e., "00000000") in the Transport Payload, is a waste of system resources (e.g., transmission bandwidth). Accordingly, it would be desirable to make more efficient use of the system resources which, to date, have been limited to "stuffing".

SUMMARY OF THE INVENTION

The present invention, in a system including variable bit-rate video data in the form of data packets which uses stuffing bytes to fill a data stream, is directed to a method and system for removing the stuffing bytes and using the additional bandwidth to transmit private data (hereinafter "privatestuff data"). The invention includes examining means for examining a data packet which includes an indication of whether stuffing bytes are being used in the data packet and determining if the data packet is eligible, according to predetermined criteria, to have the stuffing bytes removed; and re-multiplexing means, responsive to the examining means, for removing the stuffing bytes from the data packet and adding predetermined privatestuff data to the data packet.

In one aspect of the invention, the stuffing bytes are removed from a header portion of the data packet in order to gain additional transmission bandwidth.

In another aspect of the present invention, the stuffing bytes are removed from a payload portion of the data packet in order to gain additional transmission bandwidth. In both aspects, however, the privatestuff data is inserted into the header portion of the data packet.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is best understood from the following detailed description when read in connection with the accompanying drawing, in which:

Figure 1 (prior art) shows a high-level block diagram of an exemplary digital multi-program transmission and receiving system.

Figure 2 (prior art) shows a high-level block diagram of an exemplary implementation of a STD model with portions of the system shown in Figure 1.

Figure 3 (prior art) shows an exemplary format, including field designations, for a Transport Packet Stream used in conjunction with the system shown in Figures 1 and 2.

Figure 4A shows a high-level flowchart diagram illustrating the exemplary steps executed by the present invention to generally replace stuffing bytes with privatestuff data.

Figure 4B shows a high-level flowchart diagram illustrating the exemplary steps executed by the present invention to replace stuffing bytes in the adaptation field with privatestuff data.

Figure 5 shows a flowchart diagram illustrating the exemplary steps executed by the present invention to replace stuffing bytes in the packet payload with privatestuff data.

Figure 6 shows a flowchart diagram illustrating an exemplary start code processing technique suitable for use with the embodiment shown in Figure 5.

Figure 7 shows a flowchart diagram illustrating an exemplary stuffing bytes searching technique suitable for use with the embodiment shown in Figure 5.

Figures 8A through 8C illustrate three examples of stuffing byte replacements as carried out by the techniques illustrated in Figures 5-7.

Figure 9 shows a high-level functional block diagram of an exemplary embodiment of an encoder suitable for use with the present invention.

DETAILED DESCRIPTION

As mentioned in the BACKGROUND section, for Transport Stream packets carrying PES packets, stuffing is used when there is insufficient PES packet data to fill the Transport Stream packet payload bytes to support the established data rate. One way stuffing can be accomplished is by defining an adaptation field that is longer than the sum of the lengths of the data elements in it, so that the payload bytes remaining after the adaptation field exactly accommodates the available PES packet data. The extra space in the adaptation field is filled with stuffing bytes. Another way stuffing can be accomplished is by filling unused portions of the Transport Payload with zeros.

The present invention, generally applicable to variable bit-rate video, takes advantage of the otherwise wasted resources dedicated to "stuffing" in order to insert private data. In the exemplary embodiment of the present invention, to take advantage of these otherwise wasted resources, useful private data is inserted in the Transport Stream instead of the stuffing bits. That is to say, effectively, a re-multiplexing operation occurs where, based on the existence of certain predetermined conditions in the fields of the Transport Stream (e.g., stuffing bytes exist), the information necessary to replace stuffing bytes with private data yet still comply with the standard is generated and appropriately inserted.

It should be noted that, although the present invention is described as being generally applicable to variable bit rate video, it essentially is also applicable to constant bit rate video. That is to say, that, although, in the present invention, the modified video will always be variable bit rate video, the original video to be processed and transmitted may be either constant or variable bit rate video.

The data that is used to replace the stuffing bytes generally will be referred to as "privatestuff" data in order to distinguish it from typical private data which may otherwise be encoded into a Transport Stream.

When privatestuff data is inserted in the Transport Stream, if necessary, it can be sent with an individual program identification (PID) code indicating that the present Transport Packet includes privatestuff data. As described in the Systems Section, a PID is a 13-bit field in a Transport Stream Header, indicating the type of data stored in the packet payload. Some PID values are assigned and some are reserved. In the exemplary embodiment of the present invention, newly assigned PID values can be designated to indicate that the private data included in the particular Transport Packet is actually privatestuff data rather than normal private data. If a newly assigned PID is used, decoding of privatestuff data may be easier on the receiving end.

It should also be noted that, in addition to stuffing bytes, some Transport Packets are designated NULL packets using a special NULL PID. Using the techniques described herein, the present invention could also take advantage of the wasted resources of a NULL packet by remultiplexing the packet to include privatestuff data and all other appropriate fields (e.g., adaptation and private data fields).

Additionally, as the stuffing bytes are only used on an "as needed" basis, the privatestuff data is sent on a "bursty" basis, i.e., only when the video channel "wants" to send stuffing bytes. Examples of information which can be sent as privatestuff data include program reviews, program synopsis, etc for programs to be transmitted at a later time.

As additional background, in the Systems Section, a syntax representation is provided for encoding/decoding the adaptation field of a Transport Header. This syntax is represented below in Table I.

Table I -- Transport Stream adaptation field

Syntax	No.of Bits	Mnemonic
adaptation_field() {		
adaptation_field length	8	imsbf
if(adaptation_field_length>0) {		
discontinuity_indicator	1	bslbf
random_access_indicator	1	bslbf
elementary_stream_priority_indicator	1	bslbf
PCR_flag	1	bslbf
OPCR_flag	1	bslbf
splicing_point_flag	1	bslbf
transport_private_data_flag	1	bslbf
adaptation_field_extension_flag	1	bslbf
if(PCR_flag == '1') {		
program_clock_reference_base	33	uimsbf
reserved	6	bslbf
program_clock_reference_extension	9	uimsbf
}		
if(OPCR_flag == '1') {		
original_program_clock_reference_base	33	uimsbf

Table I (continued)

Syntax	No.of Bits	Mnemonic
reserved	6	bslbf
original_program_clock_reference_extension	9	uimsbf
}		
if(splicing_point_flag == '1') {		
splice_countdown	8	tcimsbf
}		
if(transport_private_data_flag == '1') {		
transport_private_data_length	8	uimsbf
for (i=0; i<transport_private_data_length;i++){		
private_data_byte	8	bslbf
}		
}		
if(adaptation_field_extension_flag == '1'){		
adaptation_field_extension_length	8	uimsbf
ltw_flag	1	bslbf
piecewise_rate_flag	1	bslbf
seamless_splice_flag	1	bslbf
reserved	5	bslbf
if(ltw_flag == '1'){		
ltw_valid_flag	1	bslbf
ltw_offset	15	uimsbf
}		
if(piecewise_rate_flag == '1'){		
reserved	2	bslbf
piecewise_rate	22	uimsbf
}		
if(seamless_splice_flag == '1'){		
splice_type	4	bslbf
DTS_next_au[32..30]	3	bslbf
marker_bit	1	bslbf
DTS_next_au[29..15]	15	bslbf
marker_bit	1	bslbf
DTS_next_au[14..0]	15	bslbf
marker_bit	1	bslbf
}		
for (i=0;i<N;i++){		
reserved	8	bslbf
}		
}		
for (i=0);i<N;i++){		
stuffing_byte	8	bslbf
}		
}		
}		

As shown in Table I, stuffing bytes are placed into the Transport Header in the adaptation field as needed.

Referring to the syntax, the adaptation_field_length, listed in Table I and illustrated in Figure 3, is an 8 bit field specifying the number of bytes in the adaptation_field immediately following the adaptation_field_length. For example, in the exemplary embodiment, the value 0 is used for inserting a single stuffing byte in a Transport Stream packet.

Moreover, when the adaptation_field_control value is '11', the value of the adaptation_field_length shall be in the range of 0 to 182. When the adaptation_field_control value is '10', the value of the adaptation_field_length shall be 183.

A stuffing_byte, for the adaptation field, is a fixed 8-bit value usually equal to '1111 1111' that can be inserted by

the encoder. Once identified as stuffing bits, this "don't care" information is discarded on the reception end by the decoder.

Continuing with Table I, in addition to the stuffing bytes, the syntax of the standard for the adaptation field provides for private data. For example, as shown in Figure 3, the two fields immediately before the stuffing bytes field are designated "5 flags" and "optional fields". The "5 flags" field indicates if the optional fields exist and, if so, the optional fields indicate the existence and length of "transport private data". This same interrelationship of the fields is also presented in syntactical format of Table I.

In addition to the stuffing bytes used in the adaptation field of the Transport Header, as mentioned, stuffing bytes may also be used in the Transport Payload. In the present invention, stuffing bytes from either the adaptation field or the Transport Payload can be removed to provide additional bandwidth for privatestuff data. It should be noted, however, whether stuffing bytes are removed from either the adaptation field or the Transport Payload or both, the privatestuff data added to the packet, in the exemplary embodiment of the present invention, is only added to an adaptation field in the Transport Header.

Figure 4A shows a high-level flowchart illustrating exemplary steps executed for generally completing a stuffing byte removal and replacement operation, also known as a remultiplexing operation. This flowchart is intended to generally illustrate stuffing byte replacement in either the adaptation field or Transport Payload.

As shown in Figure 4A, first, at step 402, a Transport Packet is captured from the Transport Stream and, then, at step 404, the Packet is examined. The examination includes determining if stuffing bytes exist, step 405, and, if so, where and how many, step 407. Then, using information obtained during the examination, at step 408, a remultiplexing operation occurs. That is, the stuffing bytes are replaced with privatestuff data. Additional details for the above steps are provided below with reference to Figures 4B, 5-7 and 8A-8C.

Figure 4B shows a high-level flowchart diagram illustrating the exemplary steps executed by the present invention to replace stuffing bytes in the adaptation field with privatestuff data. As shown in Figure 4B, first, at step 410, a Transport Packet is captured from the Transport Stream and, then, at step 412, the Packet is examined. The examination includes, initially, determining if an adaptation field exists, step 414. This can be accomplished by examining various fields. Next, if there is an adaptation field, then it is determined if private data exists in the adaptation field, step 416. In the exemplary embodiment, this can be accomplished by examining the "5 flags" field and "transport private data length" field. If private data exists, the process ends because this adaptation field, in the exemplary embodiment of the present invention, will not be used for privatestuff data. It should be noted, however, that although it is possible to insert privatestuff data when private data already exists, the present invention intentionally elects to not disturb an adaptation field which already contains private data.

Continuing with the flowchart of Figure 4B, if private data does not exist, the location and number of stuffing bytes is determined, at step 418, using the information from the various fields and, at step 420, a remultiplexing operation occurs.

Now, proceeding to the remultiplexing operation, it is important to remember that any modification of the adaptation field should adhere to established standards (i.e., the formats shown in Figure 3 and the syntax listed in Table I). Therefore, if stuffing bytes in an adaptation field are to be replaced with privatestuff data, not only is the privatestuff data multiplexed into the data stream but all of the appropriate bits in the appropriate fields are set accordingly. For example if, in a particular adaptation field, no optional fields had existed in the initial examination, the "5 flags" field is modified to reflect that after the re-multiplex operation, the optional fields do exist. Furthermore, the number of privatestuff bytes is added to the "transport private data length" field in order to properly indicate the modification of the adaptation field.

Being aware of the established standards such as those herein incorporated by reference, one of ordinary skill in the art would appreciate the various combinations of fields which may exist when attempting to replace stuffing bytes with privatestuff data, thereby, understanding that all necessary fields would have to be modified during the re-multiplexing operation to reflect the updated content of the adaptation field.

Notwithstanding the abilities of one of ordinary skill in the art, by way of example, Figures 5-7 and 8A-8C show flowcharts and field replacement diagrams detailing the steps necessary to detect and remove stuffing bytes from a single Transport Payload and utilize the consequent extra bandwidth to transmit privatestuff data in an adaption field at the transport layer.

It should be noted that the method, illustrated in Figures 5-7 and 8A-8C,

1) finds the minimum required number of video stuffing bytes within a transport packet based on the structure of its adaptation field (described above),

2) locates the positions of video stuffing bytes within a transport payload and removes these bytes from the payload,

3) inserts private data at the adaptation field, and

4) locates a picture header structure and replaces its VBV_DELAY value with 0xFFFF.

It should be further noted that the method illustrated in Figures 5-7 and 8A-8C assumes that

1) the program association table (PAT) and program map table (PMT) have been processed and the PID for the targeted video elementary stream has been recognized and

2) the parsing of the payload of the Transport Payload containing the video elementary stream starts at or before the very first video sequence header and ends at the sequence end code.

Turning to Figure 5-7, the illustrated processes examines many fields within the Transport Header and Payload as well as the tracking of some field sizes. For that purpose, variables are used throughout the process. In particular, the variable legends provided below for each of Figures 5, 6 and 7, show the particular variables used for that flowchart and their corresponding definitions:

Variables Used in Figure 5

Cnt_V_ZB	= Counter of video zero bytes
StrtCd_Fnd	= Flag to indicate a finding of a start code
PictStrtCd_Fnd	= Flag to indicate a finding of a picture start code
MIN_V_SB	= Minimum number of video stuffing bytes that need to exist in the TP packet
Cnt_V_SB	= Counter of video stuffing bytes
Cnt_Pyld_B	= Counter of the TP payload bytes

Variables Used in Figure 6

PictStrtCd_Fnd	= Flag to indicate a finding of a picture start code
StrtCd_Fnd	= Flag to indicate a finding of a start code
Cnt_Pict_Hdr	= Counter of bytes in a picture header structure

Variables Used in Figure 7

Cnt_Pyld_B	= Counter of the TP payload bytes
Cnt_V_SB	= Counter of video stuffing bytes
Cnt_V_ZB	= Counter of video zero bytes
Cnt_Cur_SB	= Counter of current video stuffing bytes
StrtCd_Fnd	= Flag to indicate a finding of a start code

Referring to Figure 5, at steps 510-514, the variables "Cnt_V_ZB", "StrtCd_Fnd" and "PctStrtCd_Fnd", which are used during processing, are initialized. At steps 516 and 518, preprocessing is performed to detect the next sync byte and verify that the PID is for an elementary video program.

At steps 520, 522 and 524, the process examines the adaptation field control and length fields and, depending on the results of the examination, sets a variable indicative of the minimum number of stuffing bytes which need to exist in the Transport Packet, steps 526 and 528.

Next, at step 530, it is determined whether there is any private data in this adaptation field. And, again, based on this determination, the process sets a variable indicative of the minimum number of stuffing bytes which need to exist in the TP packet, step 532. Here, as mentioned, if it is determined that private data already exists in the adaptation field, then the process terminates and starts anew.

The process of Figure 5, at step 536, then jumps to the first byte of the payload while, at step 538, initializing the variables "Cnt_V_SB" and "Cnt_Pyld_B".

Now, step 540 including its links to the flowcharts of Figures 6 and 7, essentially corresponds to step 404 in Figure 4A. It is here that the number and location of stuffing bytes is determined. The flowchart of Figure 6 detects and tracks start codes in the payload while the flowchart of Figure 7 detects and counts stuffing bytes. Tracking where and how many bytes of each exist, allows the process to remove the stuffing bytes (thereby providing additional bandwidth for privatestuff data) and preserve the picture data. At step 541, Cnt_V_SB is checked to ensure that it is greater than MIN_V_SB. The purpose of step 541 is to ensure that the number of found stuffing bytes in this Transport Packet is larger than the minimum number of stuffing bytes that are required to exist in order to follow through with the remultiplexing.

Finally, at steps 542 and 544 (which generally correspond to step 408 of Figure 4A), the stuffing bytes are removed

and the re-multiplexing of privatestuff data, along with appropriate control field modifications, occurs, respectively. This re-multiplexing operation is further illustrated, as indicated at step 544) by way of example in Figures 8A, 8B and 8C.

Referring to Figure 6, the process, knowing the format of start codes used by meaningful data (e.g., picture data) in the payload of a Transport Packet, counts the stuffing bits in the packet payload until a start code is encountered. A syntax for the various start codes is presented in the Video Section. This processing ensures that no meaningful picture data being carried by the Transport Packet Payload is disturbed.

As seen in steps 610 and 612, the process in Figure 6, as long as either the PictStrtCd_Fnd or the StrtCd_Fnd is equal to '1', continues to recognize and process the Transport Payload one byte at a time until the condition exist where both the PictStrtCd_Fnd and the StrtCd_Fnd are equal to '0'. When this condition is detected, the process shifts to the steps illustrated in Figure 7 which attempts to track and identify the stuffing bytes.

Until then, if PictStrtCd_Fnd is equal to '1' then the subsequent picture header bytes are tracked and processed, steps 614, 616, 618, 620, 622, 624, 626, and 628, until PictStrtCd_Fnd is finally reset at step 630. And, if PictStrtCd_Fnd is equal to '0' but StrtCd_Fnd is equal to '1' then, the current byte of data is processed, steps 632, 634, 636 and 638, such that either the PictStrtCd_Fnd is set, step 634, or the StrtCd_Fnd is reset, step 638.

It should be noted that the states of the variables PictStrtCd_Fnd and StrtCd_Fnd can reflect a condition that was processed and determined in a previous Transport Payload. That is to say, that picture data or stuffing bytes can overlap more than one Transport Payload, therefore, if the previous Transport Payload ended with a start code, the processing for the present Transport Payload should take that into consideration as Transport Packets are simply portions of a larger PES packet. For example, considering three consecutive Transport Packets, stuffing may begin midway through the Payload of the first packet, continue for the entire Payload of the second packet and end midway through the third packet. This type of condition should be considered during stuffing byte detection and removal.

Referring to Figure 7, the process searches for stuffing bytes, carefully checking the value of all bytes and tracking the location of various points used to identify and, subsequently, remove the stuffing bytes. Briefly, steps 710 and 712 process and count the zero bytes that are encountered. Eventually the byte to be processed will not be '0x00', corresonding to the NO exit path from step 710, and likely be '0x01' indicating a start code has been found, corresponding to the YES exit path of step 716. At this point, the StrtCd_Fnd variable, which is used in Figure 6, is set, step 718, and the stuffing byte counting stops. The actual number of stuffing bytes is determined by subtracting 2 from the Cnt_V_ZB, step 720, because a start code includes twenty three logical zeros and a logical one. However, step 716 only checks for seven logical zeros and a logical one, therefore, sixteen more logical zeros (or two bytes of '0x0000') are not considered stuffing bytes.

Consequently, if the number of stuffing bytes, Cnt_Cur_SB is less than the payload byte count, step 722, and not equal to zero, step 724, the location and amount of stuffing bytes is calculated and recorded using the variables such as Cnt_Pyld_B and Cnt_V_ZB which had been used to count and mark important points in the payload processing. It should also be noted that the number of stuffing bytes calculated during this processing is then added, at step 728, to the number of stuffing bytes previously recorded.

Additional discussion of Figures 6 and 7 is not warranted as one of ordinary skill in the art, having the description herein including Figures 5-7 and 8A-8C as well as the knowledge of established standards before him including those incorporated herein, can understand processes illustrated in Figures 6-7.

Figures 8A-8C show examples of Transport Packets before and after being processed by the present invention described in Figures 5-7. In particular, Figure 8A shows field replacement diagrams (i.e., original and processed) for a Transport Packet which originally had no adaptation field. This corresponds to the YES path exiting from step 520 in Figure 5. As shown in Figure 8A, the Transport Packet Payload is stripped of its stuffing bytes, an adaptation field with the appropriate fields necessary to indicate a Transport Header carrying private data is created and the packet is reconstructed such that the Payload no longer includes stuffing bytes. As seen in the legend below the depiction of the processed Transport Packet, many of the values placed in the newly formed fields (e.g., adaptation field length) are derived from the state of variables used during the processing in Figures 5-7 (e.g., Cnt_V_SB).

Figure 8B illustrates the case where the Transport Packet included an adaptation field but the length of the adaptation field was 0 bytes. This corresponds to the YES path exiting from steps 522 and 524 of Figure 5. Again, the Transport Payload is stripped of the stuffing bytes and the appropriate adaptation fields are created and/or modified according to the value of a variable.

Figure 8C illustrates yet another example where an adaptation field existed and the adaptation field length is not equal to zero and there is no private data. This corresponds to the NO path exiting from step 530 of Figure 5. Again, similar stuffing byte removal and adaptation field modifications occur.

Figure 9 shows a block diagram of an exemplary embodiment of a privatestuff processor suitable for use with the present invention. In Figure 9, the Transport Stream is captured in buffer 910 as well as monitored by an analyzer 912. Analyzer 912 performs much of the processing corresponding to steps 402-404 of Figure 4A and steps 410-418 of Figure 4B including, for payload processing, the steps in Figures 5-7 except step 544. Next, analyzer 912 instructs remultiplexer 914 whether or not to perform a remultiplexing operation and with what information. Remultiplexer 914 performs the processing corresponding to steps 408, 420 and 544. Again, the Transport Stream provided by buffer 910 is tempo-

rarily delayed by buffer 916. Buffers 910 and 916 are generally used to compensate for the processing delays of analyzer 912 and remultiplexer 914, respectively. Controller 918 performs miscellaneous control operation including controling the data flow through the buffers and ultimately deciding whether the Transport Packet will pass through multiplexer 920 or whether the processed output of remultiplexer 916 will pass.

It should be noted that, although only the general flowchart for processing the stuffing bytes in an adaptation field is provided (Figure 4B), one of ordinary skill in the art, using the information provided and known, could easily detect and removing the stuffing bytes from the adaptation field and creating or modifying fields in the adaptation field. For instance, a field replacement diagram for this case would appear quite similar to Figure 8C except the original Transport Packet would include stuffing bytes before the TP Payload and the processed Transport Packet would include new private data (i.e. privatestuff data in the appropriate private data location) and no stuffing bytes in the adaptation field. Moreover, the field locations described in Table I and illustrated in Figure 3 provide the details necessary to detect and remove stuffing bytes from the adaptation field.

Although the invention is illustrated and described herein as embodied in a method and apparatus for replacing stuffing bytes with privatestuff data in an MPEG encoded data stream, the invention is not intended to be limited to the details shown. Rather, various modifications may be made in the details within the scope and range of equivalents of the claims and without departing from the spirit of the invention.

Claims

1. In a system including constant bit-rate video data and variable bit-rate video data in the form of data packets which uses stuffing bytes to fill a data stream, a system for replacing the stuffing bytes with privatestuff data comprising:

   means for analyzing a data packet which includes an indication of whether stuffing bytes are being used in the data packet and determining if the data packet is eligible, according to predetermined criteria, to have the stuffing bytes removed; and

   re-multiplexing means, responsive to the examining means, for removing the stuffing bytes from the data packet and adding predetermined privatestuff data to the data packet.

2. The system according to claim 1, wherein the data packet includes a header portion and a payload portion and stuffing bytes are located in the header portion.

3. The system according to claim 1, wherein the data packet includes a header portion and a payload portion and stuffing bytes are located in the payload portion.

4. The system according to claim 1, wherein the data packet includes a header portion and a payload portion, wherein the data packet further includes an indication as to whether private data is being carried by the header portion of the data packet, wherein the predetermined criteria is that no private data is being carried by the header portion of the data packet.

5. The system according to claim 1, wherein the data packet includes a header portion and a payload portion and the privatestuff data is inserted in an adaptation field in the header portion.

6. In a system including constant bit-rate video data and variable bit-rate video data in the form of data packets which uses stuffing bytes to fill a data stream, a method for removing the stuffing bytes from a data packet to create additional bandwidth and using the additional bandwidth to transmit privatestuff data comprising:

   analyzing a data packet which includes an indication of whether stuffing bytes are being used in the data packet and determining if the data packet is eligible, according to predetermined criteria, to have the stuffing bytes removed;

   responsive to the analyzing step, removing the stuffing bytes from the data packet to create additional transmission bandwidth; and

   adding predetermined privatestuff data to the data packet thereby using the additional transmission bandwidth.

7. The method according to claim 6, wherein the data packet includes a header portion and a payload portion, and the stuffing bytes are removed from the header portion.

8. The method according to claim 6, wherein the data packet includes a header portion and a payload portion, stuffing bytes are removed from the payload portion.

9. The method according to claim 6, wherein the data packet includes a header portion and a payload portion, wherein the data packet further includes an indication as to whether private data is being carried by the header portion of the data packet, wherein the predetermined criteria is that no private data is being carried by the header portion of the data packet.

10. The method according to claim 6, wherein the data packet includes a header portion including an adaptation field and a payload portion, the privatestuff data is added by insertion into the adaptation field.

11. In a system including constant bit-rate video data and variable bit-rate video data in the form of data packets which uses stuffing bytes to fill a data stream, a system for replacing the stuffing bytes with privatestuff data comprising:

means for analyzing a data packet which includes an indication of whether stuffing bytes are being used in the data packet; and

re-multiplexing means, responsive to the examining means, for removing the stuffing bytes from the data packet and adding predetermined privatestuff data to the data packet.

12. The system according to claim 11, wherein the data packet includes a header portion and a payload portion and stuffing bytes are located in the header portion.

13. The system according to claim 11, wherein the data packet includes a header portion and a payload portion and stuffing bytes are located in the payload portion.

14. The system according to claim 1, wherein the data packet includes a header portion and a payload portion and the privatestuff data is inserted in an adaptation field in the header portion.

15. In a system including constant bit-rate video data and variable bit-rate video data in the form of data packets which uses stuffing bytes to fill a data stream, a method for removing the stuffing bytes from a data packet to create additional bandwidth and using the additional bandwidth to transmit privatestuff data comprising:

analyzing a data packet which includes an indication of whether stuffing bytes are being used in the data packet;

responsive to the analyzing step, removing the stuffing bytes from the data packet to create additional transmission bandwidth; and

adding predetermined privatestuff data to the data packet thereby using the additional transmission bandwidth.

16. The method according to claim 15, wherein the data packet includes a header portion and a payload portion, and the stuffing bytes are removed from the header portion.

17. The method according to claim 15, wherein the data packet includes a header portion and a payload portion, stuffing bytes are removed from the payload portion.

18. The method according to claim 15, wherein the data packet includes a header portion including an adaptation field and a payload portion, the privatestuff data is added by insertion into the adaptation field.

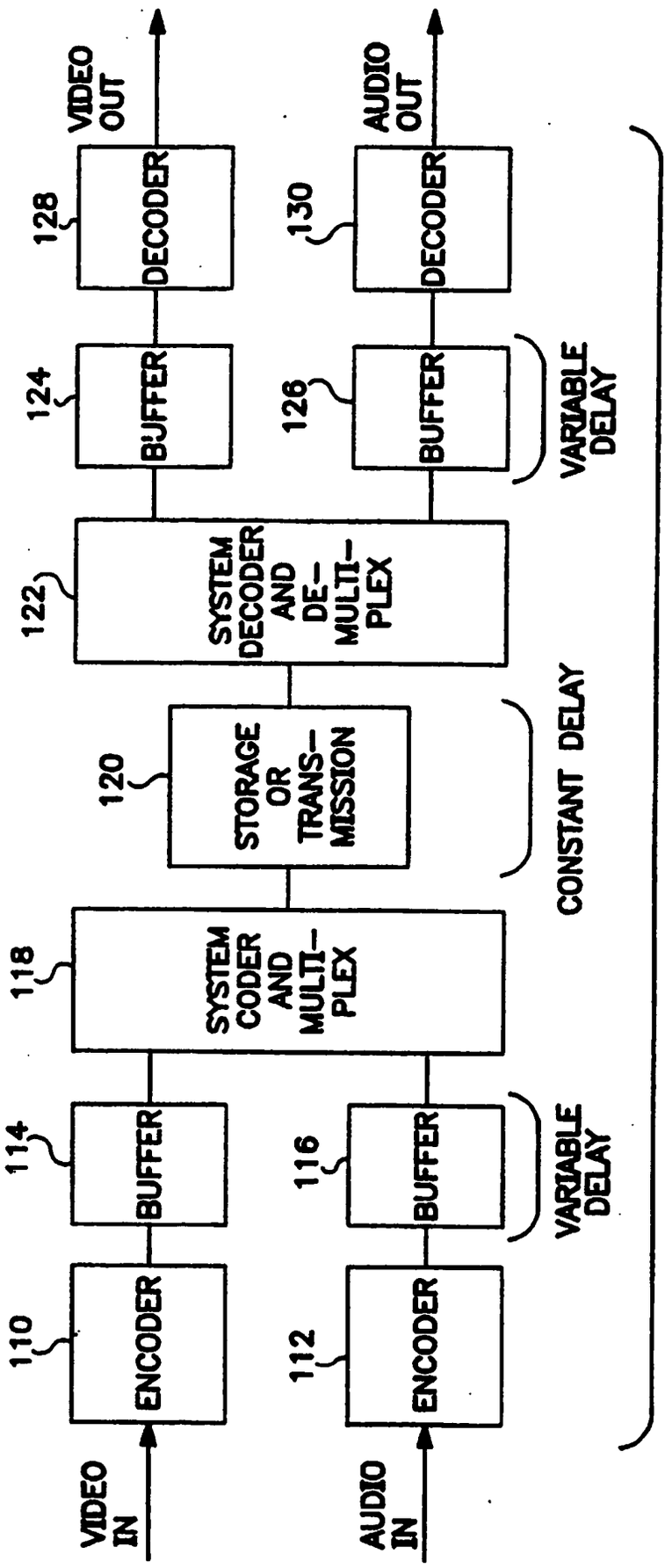


FIG. 1
(PRIOR ART)

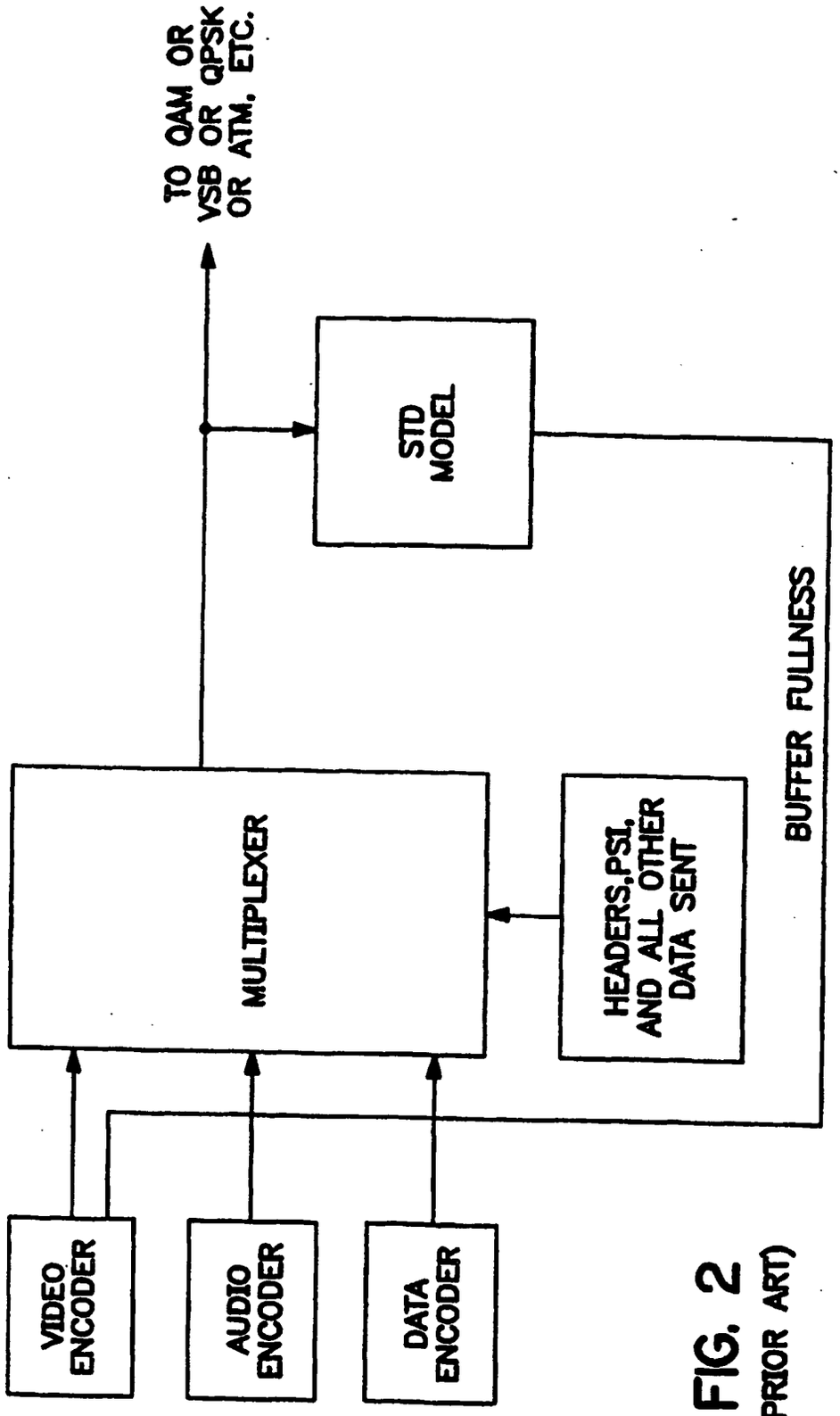


FIG. 2
(PRIOR ART)

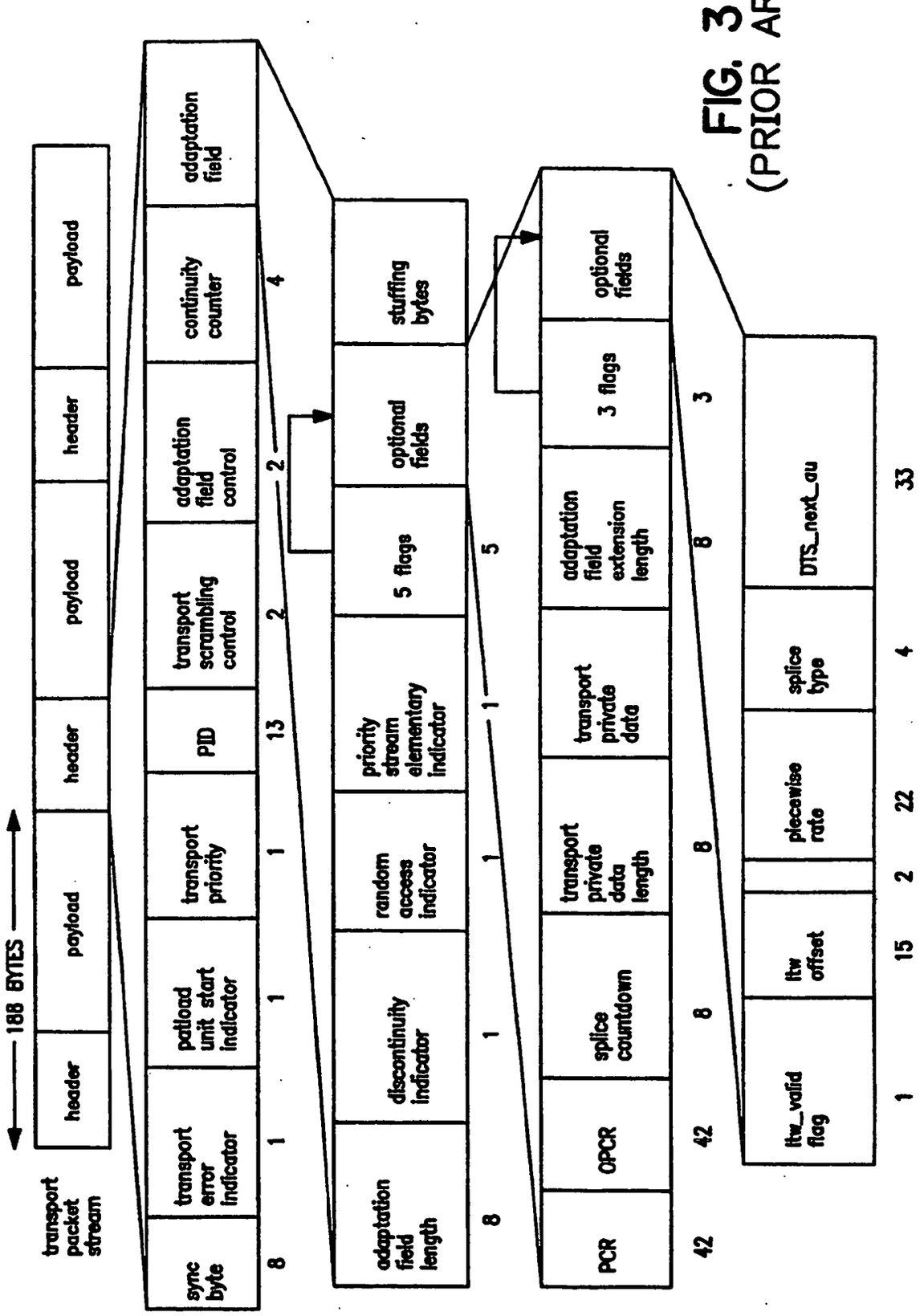


FIG. 3
(PRIOR ART)

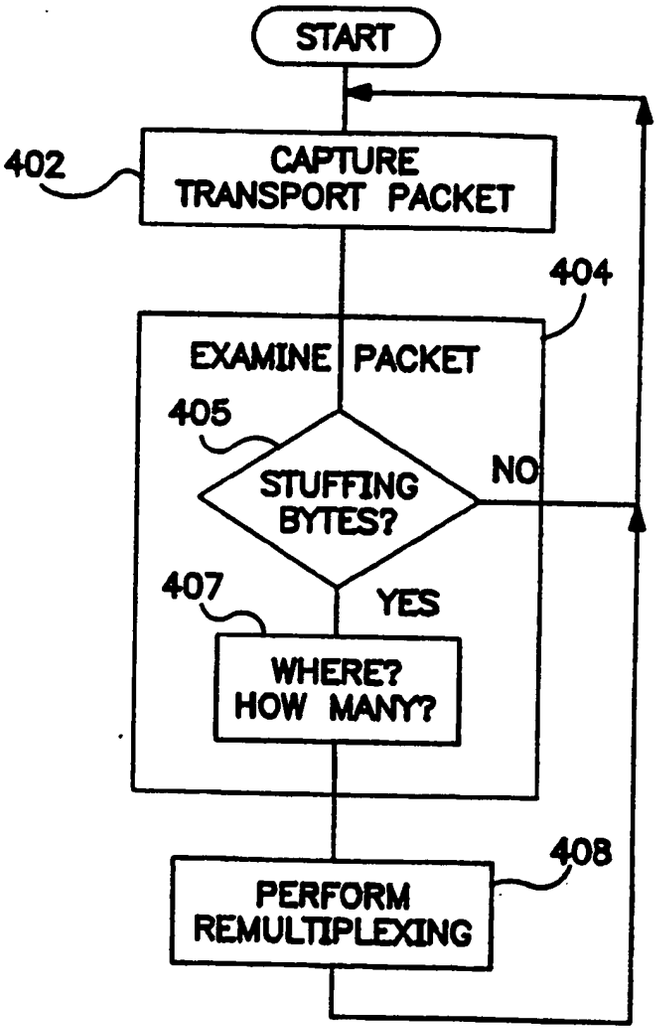

START
402
CAPTURE TRANSPORT PACKET
404
EXAMINE PACKET
405
STUFFING BYTES?
NO
YES
407
WHERE? HOW MANY?
408
PERFORM REMULTIPLEXING

FIG. 4A

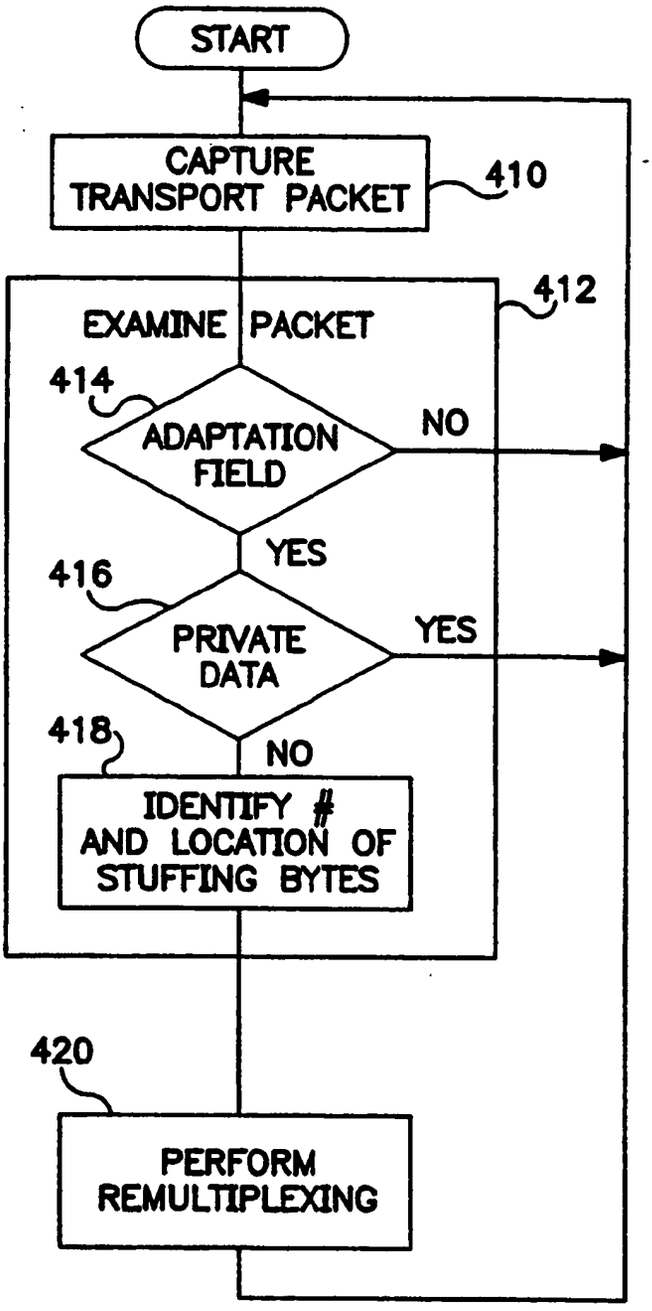

START
CAPTURE TRANSPORT PACKET
410
EXAMINE PACKET
412
414
ADAPTATION FIELD
NO
YES
416
PRIVATE DATA
YES
418
NO
IDENTIFY # AND LOCATION OF STUFFING BYTES
420
PERFORM REMULTIPLEXING

FIG. 4B

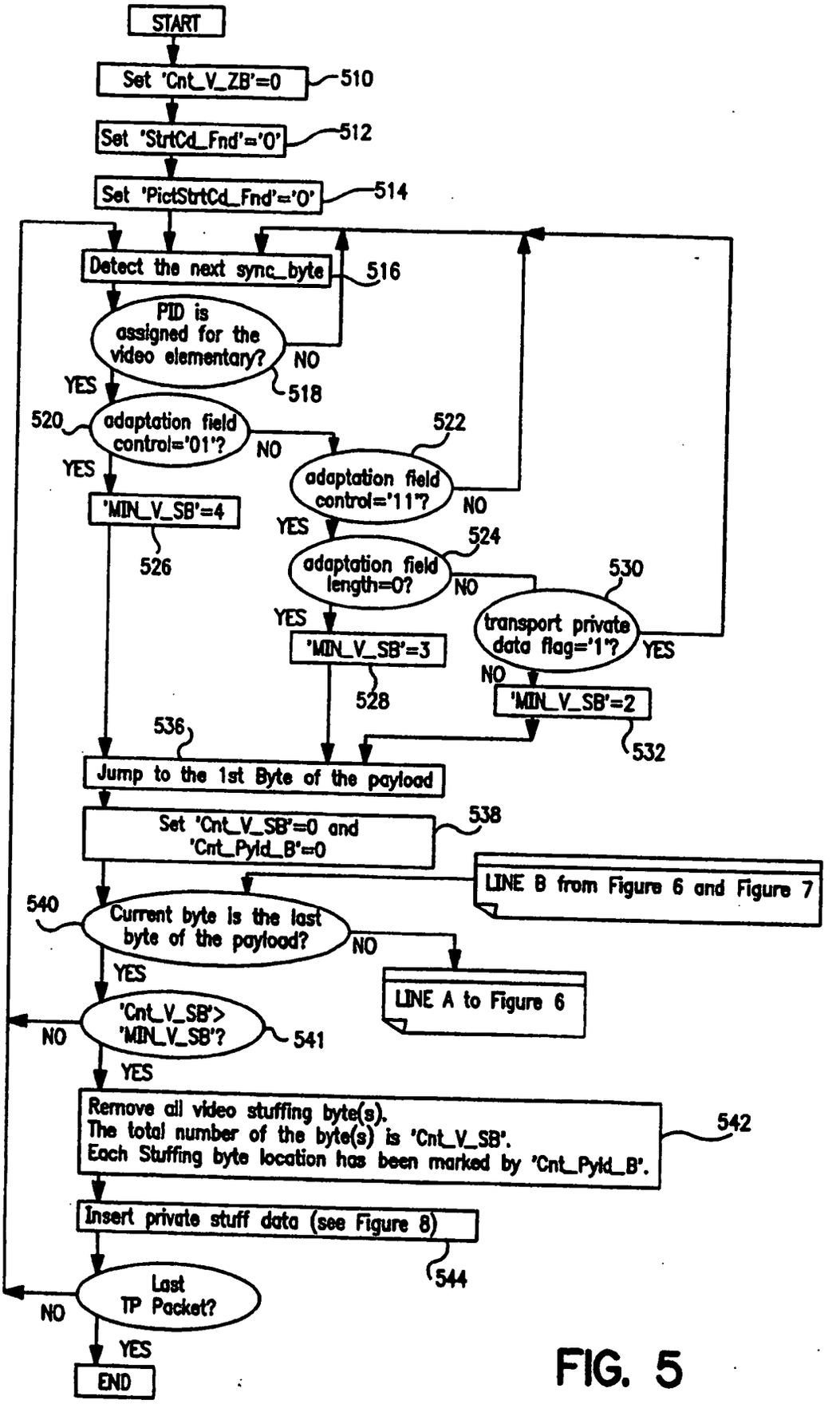

START
Set 'Cnt_V_ZB'=0
510
Set 'StrtCd_Fnd'='0'
512
Set 'PictStrtCd_Fnd'='0'
514
Detect the next sync_byte
516
PID is assigned for the video elementary?
NO
518
YES
520
adaptation field control='01'?
NO
522
YES
'MIN_V_SB'=4
526
adaptation field control='11'?
NO
YES
524
adaptation field length=0?
NO
530
YES
'MIN_V_SB'=3
528
transport private data flag='1'?
YES
NO
'MIN_V_SB'=2
532
536
Jump to the 1st Byte of the payload
Set 'Cnt_V_SB'=0 and 'Cnt_Pyld_B'=0
538
LINE B from Figure 6 and Figure 7
540
Current byte is the last byte of the payload?
NO
YES
LINE A to Figure 6
'Cnt_V_SB'> 'MIN_V_SB'?
NO
541
YES
Remove all video stuffing byte(s).
The total number of the byte(s) is 'Cnt_V_SB'.
Each Stuffing byte location has been marked by 'Cnt_Pyld_B'.
542
Insert private stuff data (see Figure 8)
544
Last TP Packet?
NO
YES
END

FIG. 5

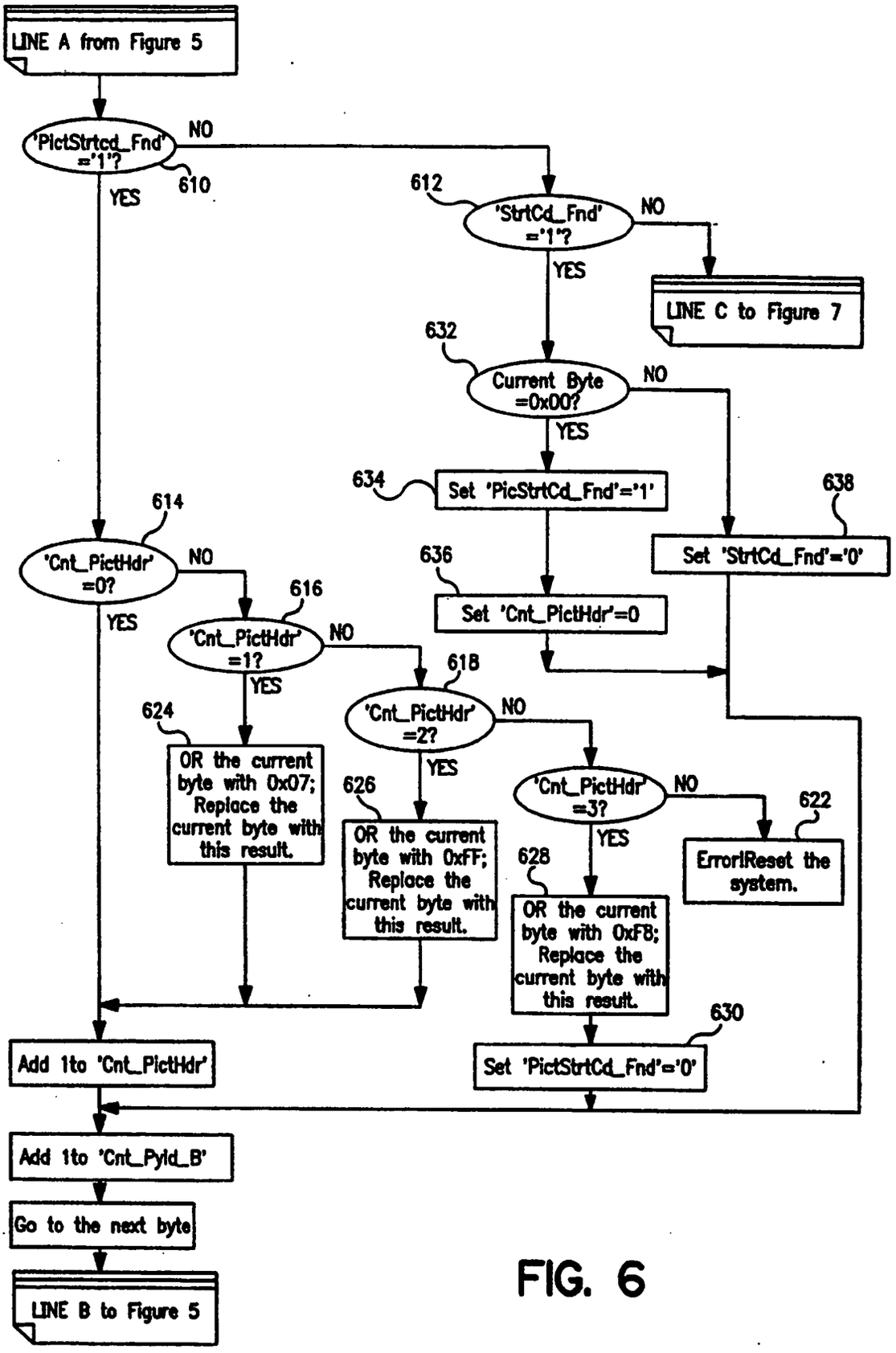

LINE A from Figure 5
'PictStrtcd_Fnd' ='1'?
NO
610
YES
612
'StrtCd_Fnd' ='1'?
NO
YES
LINE C to Figure 7
632
Current Byte =0x00?
NO
YES
634
Set 'PicStrtCd_Fnd'='1'
638
Set 'StrtCd_Fnd'='0'
614
'Cnt_PictHdr' =0?
NO
YES
636
Set 'Cnt_PictHdr'=0
616
'Cnt_PictHdr' =1?
NO
YES
618
'Cnt_PictHdr' =2?
NO
YES
624
OR the current byte with 0x07; Replace the current byte with this result.
626
OR the current byte with 0xFF; Replace the current byte with this result.
'Cnt_PictHdr' =3?
NO
YES
622
Error!Reset the system.
628
OR the current byte with 0xF8; Replace the current byte with this result.
630
Set 'PictStrtCd_Fnd'='0'
Add 1to 'Cnt_PictHdr'
Add 1to 'Cnt_PyId_B'
Go to the next byte
LINE B to Figure 5

FIG. 6

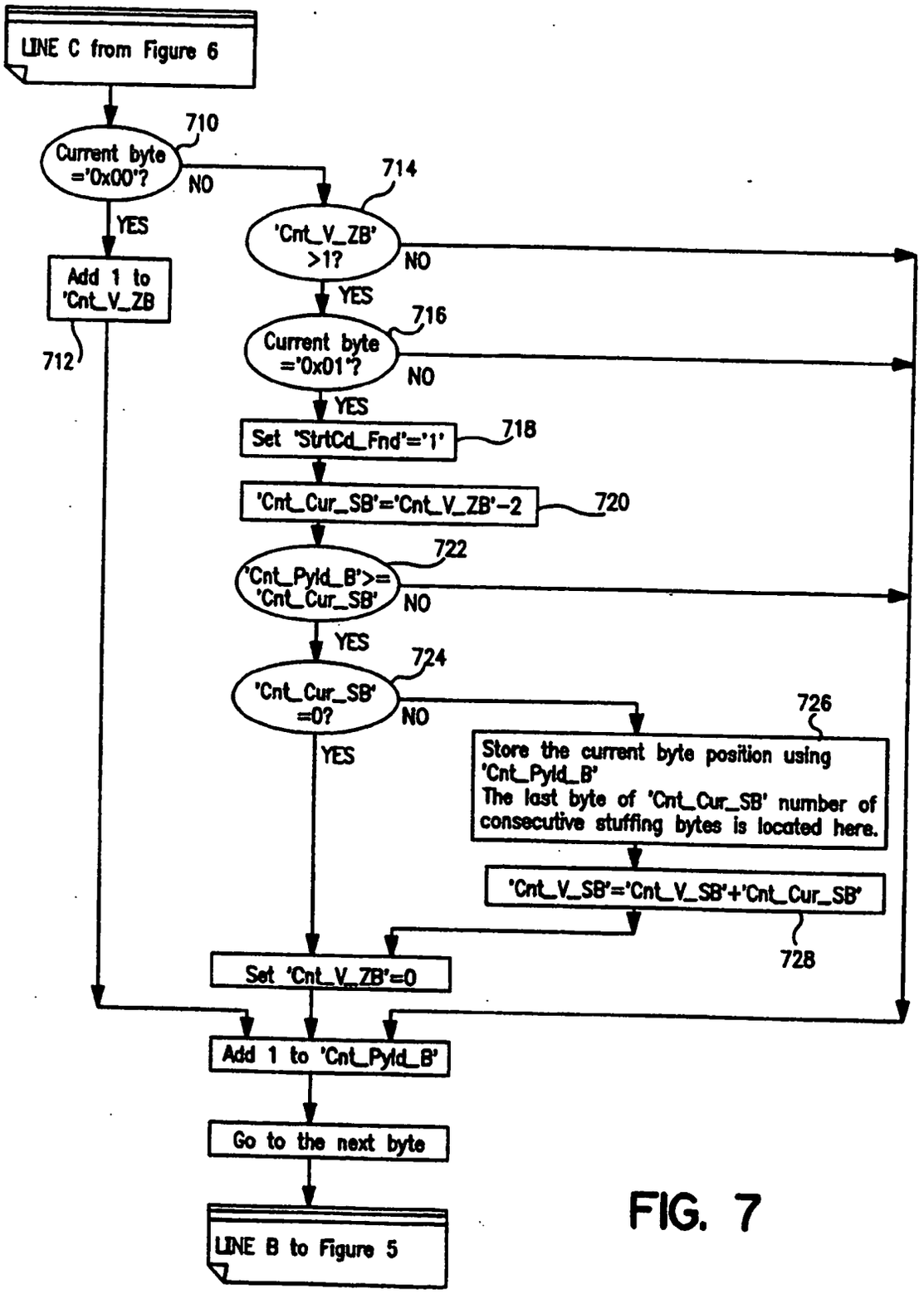
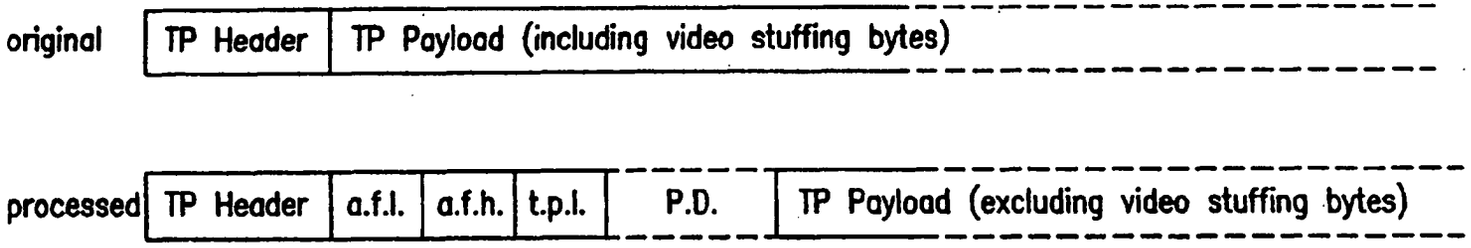

LINE C from Figure 6
710
Current byte ='0x00'?
NO
YES
714
'Cnt_V_ZB' >1?
NO
YES
Add 1 to 'Cnt_V_ZB
712
716
Current byte ='0x01'?
NO
YES
Set 'StrtCd_Fnd'='1'
718
'Cnt_Cur_SB'='Cnt_V_ZB'-2
720
722
'Cnt_Pyld_B'>= 'Cnt_Cur_SB'
NO
YES
724
'Cnt_Cur_SB' =0?
NO
YES
726
Store the current byte position using 'Cnt_Pyld_B'
The last byte of 'Cnt_Cur_SB' number of consecutive stuffing bytes is located here.
'Cnt_V_SB'='Cnt_V_SB'+'Cnt_Cur_SB'
728
Set 'Cnt_V_ZB'=0
Add 1 to 'Cnt_Pyld_B'
Go to the next byte
LINE B to Figure 5

FIG. 7

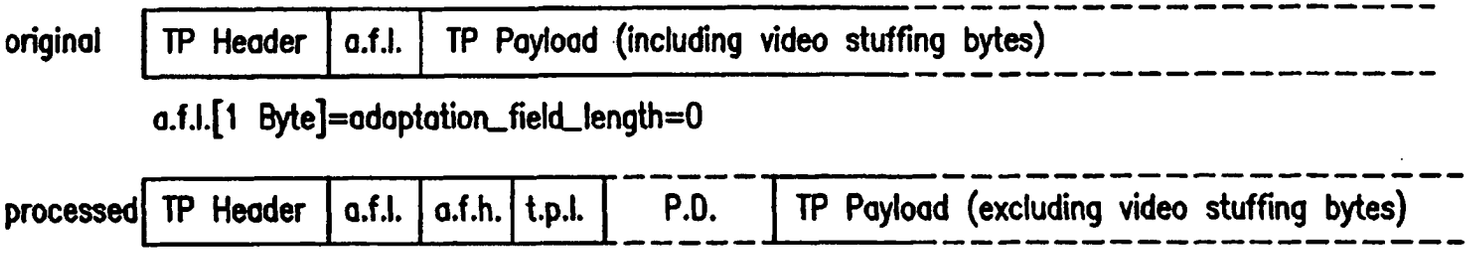
Case A:MIN_V_SB=4



a.f.l.[1 Byte]=adaptation_field_length=Cnt_V_SB-1
a.f.h.[1 Byte]=adaptation field header=0x02(to set only the transport_private_data_flag)
t.p.l.[1 Byte]=transport_private_data_length=Cnt_V_SB-3
P.D.[n Byte]=private data byte(s), where n=Cnt_V_SB-3

FIG. 8A

Case B:MIN_V_SB=3



a.f.l.[1 Byte]=adaptation_field_length=0

a.f.l.[1 Byte]=adaptation_field_length=Cnt_V_SB
a.f.h.[1 Byte]=adaptation field header=0x02(to set only the transport_private_data_flag)
t.p.l.[1 Byte]=transport_private_data_length=Cnt_V_SB-2
P.D.[n Byte]=private data byte(s), where n=Cnt_V_SB-2

FIG. 8B

Case C:MIN_V_SB=2

original

TP Header	a.f.l.	a.f.h.	a.f.e.	TP Payload (including video stuffing bytes)

a.f.l.[1 Byte]=adaptation_field_length=u
a.f.h.[1 Byte]=adaptation field header=v
a.f.e.[(u−1) Byte]=adaptation field elements

processed

TP Header	a.f.l.	a.f.h.	a.f.e.	t.p.l.	P.D.	a.f.e.	TP Payload (excluding video stuffing bytes)

a.f.l.[1 Byte]=adaptation_field_length=u+Cnt_V_SB
a.f.h.[1 Byte]=adaptation field header=(0x02) OR (v),where OR represents an or operation
t.p.l.[1 Byte]=transport_private_data_length=Cnt_V_SB−1
P.D.[n Byte]=private data byte(s), where n=Cnt_V_SB−1
a.f.e.[(u−1) Byte]=original adaptation field elements which may appear before, after, or both before and after the P.D. depending on the elements.

FIG. 8C

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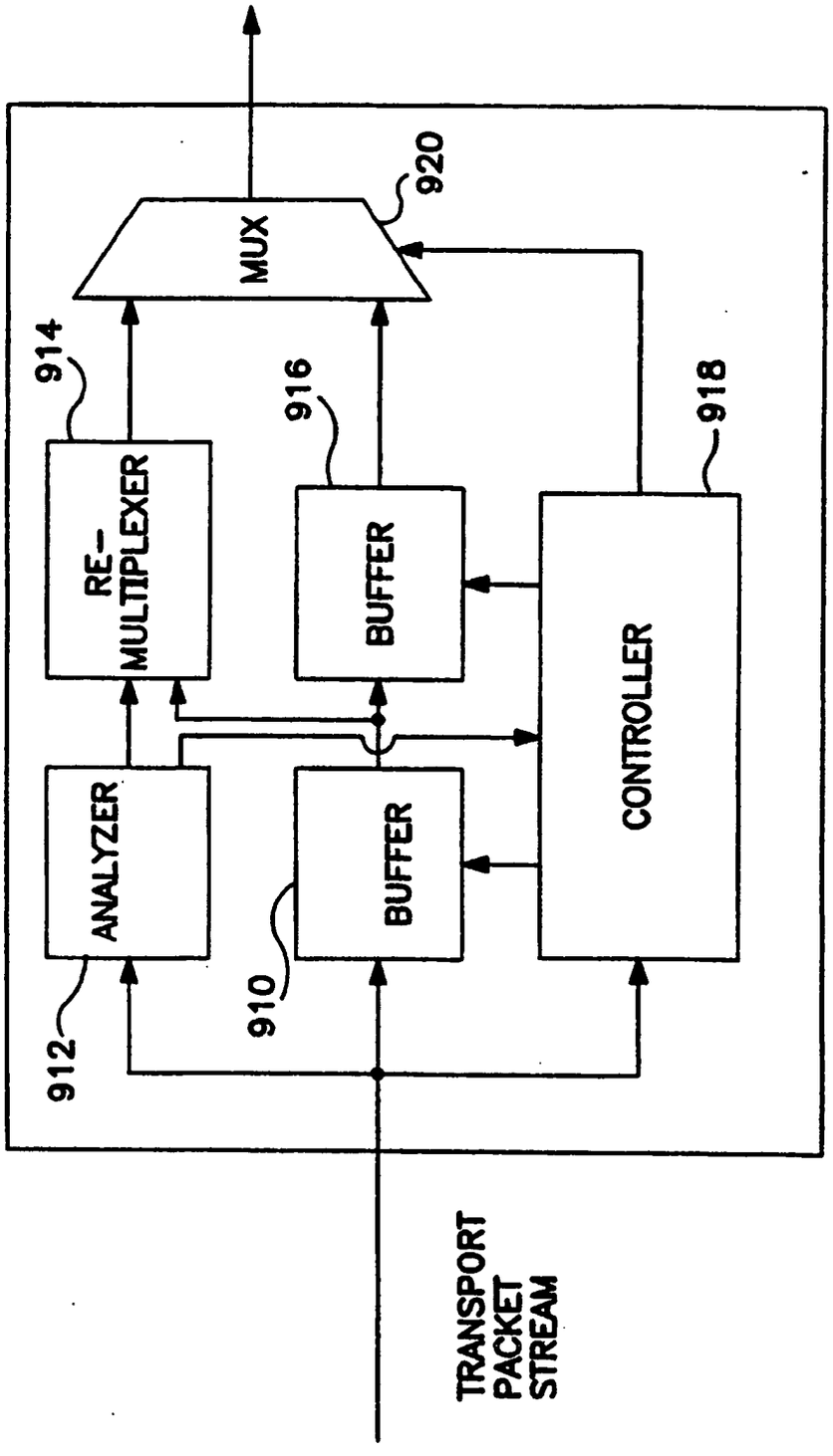
MUX
920
914
916
918
RE-
MULTIPLEXER
BUFFER
CONTROLLER
ANALYZER
BUFFER
912
910
TRANSPORT
PACKET
STREAM

FIG. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 10 6961

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	IEEE TRANSACTIONS ON CONSUMER ELECTRONICS, vol. 40, no. 3, August 1994, NEW YORK, US, pages 185-198, XP002014832 ROBERT HOPKINS: "Digital Terrestrial HDTV for North America: The Grand Alliance HDTV System" * page 193, left-hand column, line 6 - page 194, left-hand column, line 26 *	1-18	H04N7/50 H04N7/08
A	WO-A-95 06391 (THOMSON CONSUMER ELECTRONICS) * page 3, line 26 - page 4, line 32; figure 2 *	1-18	
A	US-A-5 168 356 (ALFONSE A. ACAMPORA ET AL) * column 4, line 62 - column 5, line 57; figure 1 *	1-18	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H04N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	1 October 1996	Dudley, C

EPO FORM 1503 03.82 (P04C01)

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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(54) Splicing compressed packetized digital video streams

(57) A secondary packetized data stream (IS), such as a commercial, is spliced with a primary packetized data stream (MS), such as a network television program. The system does not require decompression of the data in the primary data stream, and is particularly suitable for use at a cable system headend to allow the insertion of commercials from local businesses into a nationally broadcast television program. When a start signal (T_in)is received, a pre-splicing packet (700, 800, 900, 1000) of the primary stream is determined. The pre-splicing packet is the packet closest to the start time which carries an anchor frame (e.g., I or P frame) start code (706, 804, 905, 1003). To prevent a potential discontinuity at the decoder (168), the pre-splicing packet (700, 800, 900, 1000) is processed to discard the anchor frame data, and to insert a number of stuffing bytes (712, 812, 912, 1012) which is equal to the number of bytes discarded into an adaptation field of the pre-splicing packet. To further maintain continuity at the decoder, identifying data of the primary stream such as PID and PSI data, is retrieved and provided to the secondary stream. A number of null packets (430) are inserted into the output stream (OS) at the transition point between the main program and the commercial to prevent a buffer overflow at a decoder (168) which receives the output stream (OS).

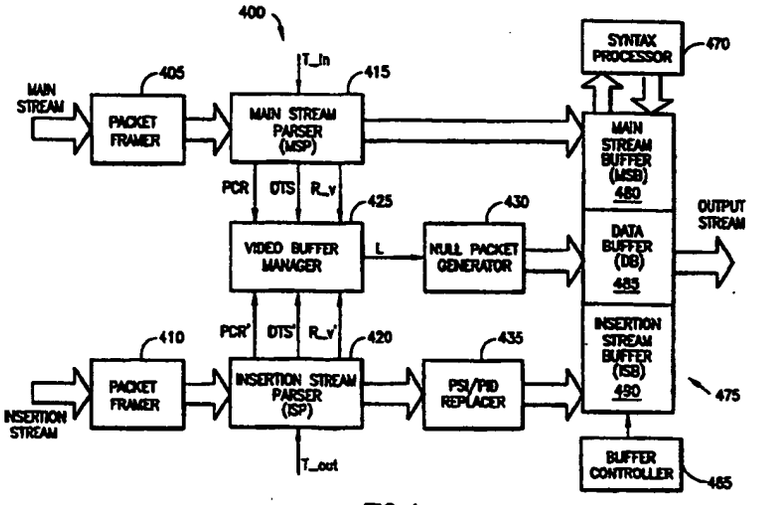

FIG.4

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Description

BACKGROUND OF THE INVENTION

The present invention relates to the communication of digital video signals, and more particularly, to the insertion of digital video messages such as commercials into a pre-existing compressed packetized data stream. Data packets of the commercial message are spliced into a pre-existing data stream (complying, e.g., with the Moving Picture Experts Group (MPEG) transmission standard) without decompressing the data in the data stream, and while maintaining compliance with the MPEG or similar digital data communication protocol.

Digital transmission schemes are particularly advantageous for signals that are broadcast from a main office by satellite to a cable television affiliate at a system headend. At the system headend, the digital data stream may be further processed and distributed to the cable system customers, for example, via a Hybrid Fiber Coax (HFC) or Fiber to the Curb (FTTC) network. Such an arrangement is known as an end-to-end digital network since digital video is compressed and transmitted from a programming source at a central office all the way to each customer's home. In an HFC network, a distribution line includes both a coaxial cable which carries radio-frequency signals, and an optical fiber which carries light wave signals. In a FTTC network, an optical fiber carries the data stream from the cable system headend to a neighborhood transfer point, or drop, and conventional coaxial cable carries the signal from the drop to the customer's home. At the customer's home, a decoder processes the digital signal to provide a signal for display on a television or other display device.

In such cable distribution systems, the received data stream may be processed at the headend prior to distribution to the system customers. In particular, commercial messages from local businesses may be inserted into the main programs. However, in order to accomplish this, conventionally the received digital data stream must be completely demodulated, demultiplexed, decrypted, decompressed and decoded to recover the signal in the analog domain. Then, the desired commercial message is provided in the analog domain and inserted into the signal to provide a new analog combined signal. Finally, the analog combined signal is digitized, encoded, compressed, encrypted, multiplexed and modulated for transmission to a customer's home. As can be seen, this process leaves much to be desired as it requires a number of time-consuming steps that must be implemented with additional hardware, including magnetic tape recorders and players. Moreover, a large magnetic tape library must be maintained and indexed. Furthermore, the conversion from digital to analog and back to the digital domain may result in degradation of the signal quality.

Thus, it would be desirable to provide a system for allowing an auxiliary compressed digital signal such as a commercial message to be inserted into a compressed digital signal of a main program without requiring decompression of the data in the main program signal. Such a system should allow cable system headed operators to conveniently insert commercial messages into a main program which is received, for example, via a nationwide or international satellite distribution network. Additionally, the system should not degrade the quality of the main program. In particular, the system should avoid any discontinuity which results in a non-compliant data stream. The system should also preclude problems such as syntax violations, decoding errors, buffer overflow or underflow, timing recovery problems due to discontinuous system time stamps, audio/video synchronisation problems, and video display artifacts. Furthermore, the system should be compatible with MPEG and similar digital data communication standards, in addition to being fully compatible with existing decoder technology. The present invention provides a system having the above and other advantages.

SUMMARY OF THE INVENTION

In accordance with the present invention, a method and apparatus are presented for splicing a secondary packetized data stream, such as a commercial, with a primary packetized data stream, such as a network television program. Advantageously, the system does not require the decompression of the data in the primary data stream, and is particularly suitable for use at a cable system headend.

A start signal is provided to indicate the time to initiate the splicing, that is, when to insert the commercial. The start signal may be embedded as data in the main program, in which case it must be recovered. Alternatively, the cable system operator may provide an external time signal. In either case, once the start signal has been received, a pre-splicing packet of the primary stream is determined. Normally, the pre-splicing packet is the packet closest to the start time which carries an anchor frame start code. The anchor frame start code indicates that data of an I or P frame is carried in the packet. Typically, such a packet may carry data from the I (or P) frame, and the frame which immediately precedes the I (or P) frame. To prevent a potential discontinuity at the decoder, the pre-splicing packet is processed to discard the anchor frame data, and to insert a number of stuffing bytes which is equal to the number of bytes discarded into an adaptation field of the pre-splicing packet. An adaptation field is created if it does not already exist.

Additionally, to maintain continuity at the decoder, identifying data of the primary stream such as PID and PSI data, is retrieved and provided to the secondary stream.

Furthermore, it may be necessary to insert a number of null packets into the output stream at the transition point

between the main program and the commercial. In particular, a number L of null packets are provided in the output stream to prevent a buffer overflow at a decoder which receives the output stream. The null packets are inserted between the pre-splicing packet of the main program and the first packet of the commercial. Similarly, when there is a transition back from the commercial to the main program, additional null packets may be inserted. The number L is determined according to the data rates of the primary and secondary streams, and provides a corresponding padding delay time which reduces the decoder's buffer level.

Also, at the transition back from the commercial to the main program, a post-splicing packet of the main program which follows the pre-splicing packet is determined. Typically, the post-splicing packet will have a sequence start code which follows the sequence end code which is associated with the last packet of the commercial. The post-splicing packet is positioned to follow the last packet of the commercial in the output stream. Moreover, processing of the post-splicing packet is analogous to processing of the pre-splicing packet. Specifically, data in the post-splicing packet which is associated with an immediately preceding packet, which may or may not be the same as the pre-splicing packet, is discarded to prevent a discontinuity at the decoder. Moreover, an amount of stuffing data is added to an adaptation field of the post-splicing packet based on the amount that was discarded. An adaptation field is created if it does not already exist.

A corresponding apparatus, including an insertion processing module, is also presented.

A decoder is also presented for decoding a transport data stream which comprises a main program and a commercial. The decoder includes a buffer for storing the transport data. The buffer has a size that is modeled at the insertion processing unit by a virtual buffer scheme. A processor is coupled to receive data from the buffer for processing to provide a signal which is routed to a television for display of the main program and the commercial, in turn. A number L of null packets are provided between a pre-splicing packet of the main program and a first packet of the commercial to prevent overflow of the buffer. In particular, the number L is determined according to the respective data rates of the main program and the commercial. Additionally, L may be determined according to a decoding delay time of the decoder, and according to a padding delay which prevents a decoding discontinuity. The decoder provides a signal for display on a display device such that a transition between the main program and the commercial, and back again, is substantially seamless.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a block diagram of a Fiber-to-the-Curb Digital Video Distribution Network in accordance with the present invention.

FIGURE 2 is a block diagram of a Hybrid Fiber Coax Digital Video Distribution Network in accordance with the present invention.

FIGURE 3 is a block diagram of a Digital Ad Insertion Module in accordance with the present invention.

FIGURE 4 is a block diagram of an Insertion Processing Unit of a Digital Ad Insertion Module in accordance with the present invention.

FIGURE 5 illustrates the processing flow of the Insertion Processing Unit of FIGURE 4 in accordance with the present invention.

FIGURES 6a to 6c are diagrammatic illustrations showing how variable length PES packets are reorganized into fixed length transport packets for use in providing a transport multiplex for transmission.

FIGURES 7a-7d show a pre-splicing data packet having an adaptation field and PES header before and after processing in accordance with the present invention.

FIGURES 8a and 8b show a pre-splicing data packet having an adaptation field but no PES header before and after processing in accordance with the present invention.

FIGURES 9a-9d show a pre-splicing data packet having no adaptation field but with a PES header before and after processing in accordance with the present invention.

FIGURES 10a and 10b show a pre-splicing data packet having no adaptation field or PES header before and after processing in accordance with the present invention.

FIGURES 11a-11d show a post-splicing data packet having an adaptation field and PES header before and after processing in accordance with the present invention.

FIGURES 12a and 12b show a post-splicing data packet having an adaptation field but no PES header before and after processing in accordance with the present invention.

FIGURES 13a-13d show a post-splicing data packet having no adaptation field but with a PES header before and after processing in accordance with the present invention.

FIGURES 14a and 14b show a post-splicing data packet having no adaptation field or PES header before and after processing in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

A method and apparatus are presented for splicing a secondary packetized data stream, such as a commercial, with a primary packetized data stream, such as a network television program.

FIGURE 1 is a block diagram of a Fiber-to-the-Curb Digital Video Distribution Network in accordance with the present invention. The distribution network includes Video Information Providers (VIPs) shown generally at 100, a gateway, shown generally at 120, an access network, shown generally at 140, and the home of a Video Information User (VIU), shown generally at 160. The gateway 120 may comprise an L1 Gateway manufactured by Teleco. The VIPs may include a video server 102, an interactive data server 104, and an internet gateway 106, all of which communicate with an asynchronous transfer mode (ATM) network 122 via, for example, an OC-3 system, where optical fiber is used to transmit data at 155.52 Mbit/sec. The ATM network 122 may also receive data via a satellite receiving antenna 110, broadcast encoder and server 112, and ATM multiplexer 114. The ATM network 122 communicates with a session manager 123.

The ATM network 122 may provide information to one or more access networks, such as a cable television distribution headend 140. First, however, the information from the ATM network is processed via a Digital Ad Insertion Module (DAIM) 130 in accordance with the present invention. Information, such as a network television program, passes between the ATM network 122 and the DAIM 130 via an ATM receiver (Rx) interface (I/F) 124. The DAIM 130 receives the information as a compressed digital packetized data stream and accesses an inserted stream storage unit 135. The storage unit may include a digitized library of advertisements (e.g., commercials) which are available to insert into the network television program. The storage unit 135 may include digital audio tapes (DATs), digital video disks (DVDs), compact audio discs (CDs) or other magnetic or optical storage media.

In accordance with the present invention, the DAIM 130 inserts a compressed digital packetized advertisement stream into the compressed digital packetized data stream of the network television program without decompressing the program. Moreover, when the television program is in an MPEG-2 or similar format, the DAIM maintains compliance with the MPEG-2 protocol. Of course, while the embodiment of FIGURE 1 is particularly suited for the insertion of advertisements into a network television program, there are many other useful applications, including the insertion of educational programming, emergency messages such as weather bulletins, informational messages from the cable system operator, and the like. Furthermore, audio only or data only messages may be inserted into the main packetized data stream. Moreover, the same message may be inserted into more than one main program at the same time, and different messages may be inserted into different main programs at the same time.

A compressed digital packetized data stream which includes the inserted message combined with the main program is output from the DAIM 130 to an ATM transmitter (Tx) interface 126, and then provided to an access network (e.g., cable system headend) 140. In the access network 140, a Host Digital Terminal (HDT) 144 receives the data stream and also receives control signals from an element manager 142, which manages the cable network. The HDT 144, which is a specialized digital switch which is typically located in a head office of the cable system, communicates with one or more Optical Node Units (ONUs), including ONU 146. The ONU is located in the local curb, and supports an optical to electrical conversion and modulation/demodulation. The ONU 146 then provides the data stream over a coax distribution network to one or more subscriber's homes or offices. At each home, a drop box 164 located near the home receives the combined digital signal and provides it to a Digital Entertainment Terminal (DET) (e.g., decoder) 168 and a Network Interface Module (NIM) 166. The DET decodes the packetized data stream, and the signal is seamlessly delivered for display to the Video Information User (VIU) (e.g., subscriber) via televisions 170, 172 and/or personal computer 174.

FIGURE 2 is a block diagram of a Hybrid Fiber Coax Digital Video Distribution Network in accordance with the present invention. Like-numbered elements correspond to the elements of FIGURE 1. The distribution network includes a satellite uplink, shown generally at 200, a satellite downlink, shown generally at 240, an access network 140 and a VIU's home 160. The satellite uplink 200 includes a broadcast encoder and server 205, which may also perform an encryption function, an MPEG multiplexer 210, a modulator 215, and a transmitting antenna 220. The satellite downlink 240 includes a receiving antenna 242, and an integrated receiver 244. The signal received at the antenna 242 typically comprises a multiplex of encrypted channels (e.g., one hundred or more channels) from various programming service providers. The received multiplexed signal is processed at the integrated receiver 244 by a demodulator 246 and decryption function 248.

The recovered multiplex of channels is then provided to the DAIM 250 for processing in accordance with the present invention. The DAIM accesses an inserted stream storage unit 135 to retrieve a compressed digital packetized message for insertion into one or more main channels of the multiplex. After processing by the DAIM, the one or more combined signals are received by a transcoder 260 for encryption and/or modulation at function 265, as well known in the art. The multiplex of signals, including the signal with the inserted messages, is then received by the access network 140 and transmitted to the subscribers' homes for display at the VIU's home 160 as discussed in connection with FIGURE 1.

FIGURE 3 is a block diagram of a Digital Ad Insertion Module (DAIM) in accordance with the present invention. Advantageously, the DAIM 300 is compatible with existing communication networks, including the Fiber-to-the-curb network of FIGURE 1, and the Hybrid Fiber Coax network of FIGURE 2. The DAIM receives a main stream (MS) which comprises a primary data stream such as a network television program, and an insertion stream (IS), which comprises a secondary data stream such as a commercial message. Within the DAIM, an external control interface 310 communicates with an Insertion Processing Unit (IPU) 400. After the commercial message is inserted into the main stream, an output stream is produced.

FIGURE 4 is a block diagram of an Insertion Processing Unit (IPU) of a Digital Ad Insertion Module in accordance with the present invention. The IPU, shown generally at 400, receives the main stream at a packet framer 405, while the insertion stream is received at another packet framer 410. After processing by the packet framer 405, the main stream is provided to a Main Stream Parser (MSP) 415. The MSP also receives an input labeled T_in, which is the desired starting time of the insertion of the insertion stream into the main stream. Similarly, after processing by the packet framer 410, the insertion stream is provided to an Insertion Stream Parser (ISP) 420. The ISP also receives an input labeled T_out, which is the desired ending time of the insertion of the insertion stream into the main stream. T_in may be carried in the main stream, or it may be provided locally, such as at the cable system headend. Similarly, T_out may be carried in the main stream, insertion stream, or may be generated locally.

The main stream parser 415 parses the data packets of the main stream and provides signals to a video buffer manager 425. These signals include a Program Clock Reference (PCR), a Decoding Time Stamp (DTS), and a video bit rate, R_v, for the main stream. Similarly, the insertion stream parser 420 parses the data packets of the insertion stream to provide PCR', DTS' and R_v' signals to the video buffer manager 425, where the prime notation indicates a parameter of the insertion stream. The video buffer manager 425 uses the input signals to determine a number, N, of null packets which will be inserted into the output data stream. In particular, to avoid a decoder buffer overflow, it may be necessary to add null packets to the output stream during the transition from the main to the insertion stream, and during the transition from the insertion to the main stream, if the insertion stream has a higher data rate than the main stream. The number of null packets is provided to a null packet generator 430 and then to a Data Buffer (DB) 485 which is part of an output buffer 475. The DB 485 communicates with a syntax processor 470.

The main stream parser 415 provides the main stream data to a main stream buffer 480, which communicates with a syntax processor 470. The main stream buffer 480 is part of the output buffer 475. The insertion stream parser 420 provides the insertion stream data to a Program Specific Information (PSI)/Program Identifier (PID) Replacer 435, which replaces the PSI tables and PIDs of the insertion stream with those of the main stream. The PSI/PID replacer 435 retrieves the relevant information from the main stream using a communication path which is not shown. The PSI and PID data of the main stream provide the information to connect the various audio, video, and data packets to a particular programming service. Specifically, this is accomplished using a Program Association Table (PAT) and a Program Map Table (PMT). The insertion stream is then provided to an Insertion Stream Buffer (ISB) 490, which is part of the output buffer 475. The ISB 490 communicates with a syntax processor 470. Furthermore, the output buffer 475 receives commands from a buffer controller 465 to provide an output stream with the insertion stream seamlessly spliced into the main stream.

Further details of the various elements of the insertion processing unit 400 of FIGURE 4 will now be discussed. The following terms and variables will be used:

IPU: Insertion Processing Unit - a unit inside the Digital Ad-Insertion Module.
Main Stream (MS): The incoming digital stream that carries the normal digital video programming services.
Insertion Stream (IS): The digital stream segment that will be inserted into the main stream.
Output Stream (OS): The outgoing main stream after insertion.
T_in: The external signal indicating the desired starting time of the insertion in the main stream.
T_out: The external signal indicating the desired ending time of the insertion in the main stream.
sp_in: The insertion starting position, or splicing start point, in the main stream. It is generated internally by the DAIM, and is not necessarily coincident with T_in.
sp_out: The insertion ending position, or splicing end point, in the main stream. It is generated internally by the DAIM, and is not necessarily coincident with T_out.
sp_in': The starting position of the insertion segment in the insertion stream.
sp_out': The ending position of the insertion segment in the insertion stream.
MPEG: Moving Picture Experts Group for video, audio and system coding format.
TS: The MPEG Transport Stream which uses the 188 byte packet format.
Null Packet: A transport packet that does not contain any valid audio/video data.
L: Number of null packets.
PID: The Program IDentifier carried in each MPEG transport packet indicating the presence of a data stream.
PSI: Program Specific Information carried in the transport packet indicating the mapping of a group of PIDs to indi-

vidual programs. It includes PAT/PMT.

PES: Packetized Elementary Stream is a layer of data carried by the TS.

ES: Elementary Stream - can be video, audio, or data.

PCR: Program Clock Reference - system clock time stamps which are carried in the main stream.

PCR': Program Clock Reference - system clock time stamps which are carried in the insertion stream.

DTS: Decoding Time Stamps indicating the decoding time of each ES element in the main stream.

DTS': Decoding Time Stamps indicating the decoding time of each ES element in the insertion stream.

R_v: Video bit rate for the main stream.

R_v': Video bit rate for the insertion stream.

Sequence Header: The highest layer of header in a MPEG video stream.

GOP Header: Group of Pictures header - the second layer of header followed by a complete self-contained sequence of pictures (e.g., frames).

Picture Header: The header which precedes each picture.

I Picture: Intra-coded picture that can be decoded without referring to another picture.

P Picture: Forward predicted picture that can be decoded using the previous decoded I or P picture.

Anchor Picture: I or P pictures are anchor pictures since they may be used as a reference to predict another picture.

B Picture: Bi-directionally predicted picture that can be decoded using the previous and next I or P decoded picture. Cannot be used as an anchor picture.

vbv_Buffer: Virtual Buffer Verifier (VBV) - a conceptual decoder channel buffer that shall not overflow or underflow.

R_t: Transport stream data rate.

The IPU 400 can process a main transport stream that includes one or more programs (e.g., channels). If the main stream carries only a single program, the IPU inserts the insertion stream into the main stream. Note that the terms "insertion stream," "secondary stream," or the like as used herein can denote replacement (e.g., overwriting) of packets of the main stream as well as insertion without loss of any main stream packets. However, this latter case will require a large amount of memory to store the portion of the main stream which is temporarily suspended while the insertion stream is transmitted.

If the main stream carries a plurality of programs, the IPU can insert the packets of the insertion stream into transport packets in the main stream that belong to one or more selected programs. In this case, the data rate of each elementary stream in the insertion stream should be the same as the data rate of the corresponding programs in the main stream. For example, the rate of a video elementary stream in the insertion stream should be equal to the rate of the video elementary main stream which is to receive the insertion data. The IPU processes the packets near the beginning and end of the insertion so the resulting stream is MPEG compliant.

The main stream packet framer 405 receives a fully compliant, unaligned MPEG-2 main transport stream at its channel input. The main stream data is in a serial format. The MPEG-2 transport packet synchronization byte may occur at any bit position. The packet framer 405 provides the transport packet alignment, and outputs a transport stream which is aligned to the packet boundary. The insertion stream packet framer 410 performs a similar function for the insertion stream.

The Main Stream Parser (MSP) 415 and Insertion Stream Parser (ISP) 420 are used to parse the main stream and insertion streams, respectively. The stream parsers parse the respective aligned streams of the packet framers 405 and 410 from the transport layer to the picture layer. At a time prior to T_in, the MSP 415 bypasses the main stream in its input and send the stream directly to the main stream buffer 480, and the ISP 420 parses the input insertion stream to locate the sequence start code. When a packet with a sequence start code is detected in the insertion stream, the ISP puts the address of this packet into a register (not shown). The address is a read address for the insertion stream.

As soon as T_in is detected, the MSP parses the main stream to locate the transport packet with the next, or most recent previous (if still available), anchor picture start code. When an I or P picture start code is found in the main stream transport packets, the MSP 415 sends the transport packet which contains the anchor picture start code (e.g., the last packet of the main stream) to the syntax processor 470 for processing. Also at this time, the ISP 420 sends the first packet of the insertion stream to the syntax processor 470 to be "fixed" or "repaired", as discussed below in greater detail. When a video buffer verifier (e.g., MPEG parameter "vbv_buffer") management is required, the MSP 415 and ISP 420 will also have to parse the PCR, DTS, video rate R_v or R_v', and other parameters as required, store them in the data buffer 485, and provide them to the video buffer manager 425.

The VBV is a hypothetical decoder which is conceptually connected to the output of an encoder. Coded data is placed in the buffer at the constant bit rate that is being used, and is removed according to which data has been in the buffer for the longest period of time. The bitstream produced by an encoder or editor must not cause the VBV to either overflow or underflow. The MSB 415 and ISB 420 output the same transport stream which appeared at the input after parsing as discussed.

At the time T_out, the operation of the MSP and ISP is similar to the T_in point, except that the main stream and

insertion stream are interchanged. That is, after the insertion stream has been inserted into the main stream, the main stream must be coupled with the end of the insertion stream. To accomplish this, as soon as T_out is detected, the ISP will parse the insertion stream to locate the transport packet with the next, or most recent previous (if still available), anchor picture start code. When an I or P picture start code is found in the insertion stream transport packets, the ISP 420 sends the transport packet which contains the anchor picture start code (e.g., the last packet of the insertion stream) to the syntax processor 470 for processing. Also at this time, the MSP 415 sends the first packet of the remainder of the main stream to the syntax processor 470 for processing. In this manner, the transition from the end of the insertion stream to the beginning of the remainder of the main stream can be performed seamlessly.

The video buffer manager 425 checks for the fullness of the video buffer according to its inputs, PCR, PCR', DTS, DTS', and video data rates R_v and R_v'. In case of a potential buffer overflow, it instructs the null packet generator 430 to generate L null packets and insert the packets into the output stream. The number of packets to generate is stored in a register.

The syntax processor 470, which can communicate with the MSB 480, DB 485 and ISB 490 of the output buffer 475, processes the last packet before the splicing point and the first packet after the splicing point to provide a seamless transition that is MPEG compliant. At T_in, the syntax processor 470 reads the last transport packet from the main stream and the first packet from the insertion stream. It checks the syntax of the packets and repairs them, if necessary, so that they will be MPEG compliant, as will be discussed below in greater detail. At T_out, the syntax processor 470 operates in the similar way except that the main stream and insertion stream are interchanged. That is, the syntax processor 470 will read the last transport packet from the insertion stream and the first packet from the main stream, and then check the syntax of the packets and repair them, if necessary. Thus, the syntax processor 470 receives unfixed packets and addresses for the unfixed packets, and outputs fixed packets.

In the event of potential buffer overflow, the null packet generator 430 is instructed by the video buffer manager to generate null packets and insert them to the output. Thus, the null packet generator 430 receives a signal to generate null packets, and the number L of packets to generate, and outputs null packets.

It is desired that the PIDs of the resulting output stream do not change after the insertion. Accordingly, a PSI/PID replacer 435 is provided to replace the PSI tables and PIDs of the inserted stream with those of the main stream. The PSI/PID replacer 435 receives transport packets with the old PSI/PID, new PSI tables, and a PID conversion table, and outputs transport packets with the PSI/PID replaced.

The output buffer 475 is divided into three parts. The Data Buffer (DB) 485 is used to store common data such as PSI and null packets. The Main Stream Buffer (MSB) 480 and Insertion Stream Buffer (ISB) 490 are used to store the main stream and insertion stream, respectively.

A buffer controller 465 is used to coordinate the read and write operations of the DB, MSB, and ISB. It also performs addressing and output scheduling of each transport packet stored in the MSB, ISB and DB.

A group of registers (not shown) is used in the system for storing various parameters such as packet addresses and N, the number of null packets. A map of registers which may be used in accordance with the present invention is given in Table 1, below. It should be appreciated that Table 1 is an example only, and any other suitable map could be used. In Table 1, the first column indicates the register index, the second column indicates the number of bits, the third column indicates whether read (R) and/or write (W) capability is required, and the fourth column describes the function of the register location.

Table 1

Index	Bits	R/W	Description
1	7:0	R,W	Read address for main stream
2	7:0	R,W	Read address for main stream
3	7:0	R,W	Read address for main stream
4	7:0	R,W	Read address for main stream
5	7:0	R,W	Write address for main stream
6	7:0	R,W	Write address for main stream
7	7:0	R,W	Write address for main stream
8	7:0	R,W	Write address for main stream
9	7:0	R,W	Read address for insertion stream
10	7:0	R,W	Read address for insertion stream
11	7:0	R,W	Read address for insertion stream
12	7:0	R,W	Read address for insertion stream
13	7:0	R,W	Write address for insertion stream
14	7:0	R,W	Write address for insertion stream
15	7:0	R,W	Write address for insertion stream
16	7:0	R,W	Write address for insertion stream
17	7:0	R,W	PCR of current stream
18	7:0	R,W	PCR of current stream
19	7:0	R,W	PCR of current stream
20	7:0	R,W	PCR of current stream
21	7:0	R,W	PCR of current stream
22	7:0	R,W	PCR of current stream
23	7:0	R,W	DTS of current stream
24	7:0	R,W	DTS of current stream
25	7:0	R,W	DTS of current stream
26	7:0	R,W	DTS of current stream
27	7:0	R,W	DTS of current stream
28	7:0	R,W	Address for PAT
29	7:0	R,W	Address for PAT
30	7:0	R,W	Address for PAT
31	7:0	R,W	Address for PAT
32	7:0	R,W	Size of PAT in number of packets
33	7:0	R,W	Address for PMT
34	7:0	R,W	Address for PMT
35	7:0	R,W	Address for PMT
36	7:0	R,W	Address for PMT

37	7:0	R,W	Size of PMT in number of packets
38			Interrupt register.
	7	R	SS, Splicing signal. 1: SS is detected; 0: splicing processing done
	6	R	MSD, 1: Main stream done
	5	R	ISD, 1: Insertion stream done
	4	R	NPD, 1: Null packets done
	3	R	APF, 1: Anchor picture found
	2:0	N/A	Reserved
39	7:0	R,W	Number of Null packets to generate
40	7:0	R,W	Stream output read address
41	7:0	R,W	Stream output read address
42	7:0	R,W	Stream output read address
43	7:0	R,W	Stream output read address
44	7:0	R,W	Main video elementary stream rate
45	7:0	R,W	Main video elementary stream rate
46	7:0	R,W	Main video elementary stream rate
47	7:0	R,W	Insertion video elementary stream rate
48	7:0	R,W	Insertion video elementary stream rate
49	7:0	R,W	Insertion video elementary stream rate
50	7:0	R,W	PID1 of main stream
51	7:3	R,W	PID1 of main stream
51	7:0	R,W	PID2 of main stream
52	7:3	R,W	PID2 of main stream
53	7:0	R,W	PID3 of main stream
54	7:3	R,W	PID3 of main stream
55	7:0	R,W	PID4 of main stream
56	7:3	R,W	PID4 of main stream
57	7:0	R,W	PID1 of insertion stream
58	7:3	R,W	PID1 of insertion stream
59	7:0	R,W	PID2 of insertion stream
60	7:3	R,W	PID2 of insertion stream
61	7:0	R,W	PID3 of insertion stream
62	7:3	R,W	PID3 of insertion stream
63	7:0	R,W	PID4 of insertion stream
64	7:3	R,W	PID4 of insertion stream
65-68	7:0	R,W	Read address for PID1 of insertion stream
69-72	7:0	R,W	Write address for PID1 of insertion stream
73-76	7:0	R,W	Read address for PID2 of insertion stream

77-80	7:0	R,W	Write address for PID2 of insertion stream
81-84	7:0	R,W	Read address for PID3 of insertion stream
85-88	7:0	R,W	Write address for PID3 of insertion stream
89-92	7:0	R,W	Read address for PID4 of insertion stream
93-96	7:0	R,W	Write address for PID4 of insertion stream

The complexity of the IPU largely depends on the video buffer management scheme. Two implementations of a video buffer management scheme in accordance with the present invention are presented. First, in a simplified version, the number L of null packets for padding the output stream to prevent buffer overflow are provided only according to the video elementary stream data rates of the main and insertion stream, R_v and R_v', respectively. At T_in, the number of packets to pad with null data is computed as:

L = vbv_buffer_size * (1/R_v - 1/R_v') * R_t / (188*8).

At T_out, the number of packets to pad is computed as:

L = vbv_buffer_size * (1/R_v'- 1/R_v) * R_t / (188*8).

The advantage of this scheme is a simplified implementation, and there is no need to track the PCR and DTS of the stream. The disadvantages are that padding is larger than needed, and decoding or display discontinuities may result. Note that padding is required only when the insertion stream has a higher data rate than the main stream.

In a second, more complete version of the video buffer management scheme, padding is used according to a decoding delay of the main and insertion stream and the video elementary stream rates. The decoding delay is the difference between the time the first byte of a picture is received and the time when decoding is completed. With this scheme, at T_in, the number of packets to pad is computed as:

L = (decoding_delay - vbv_buffer_size/R_v') * R_t / (188*8).

At T_out, the number of packets to pad is computed as:

L = (decoding_delay - vbv_buffer_size/R_v) * R_t / (188*8).

The advantages of this second embodiment are that padding is used only as needed, and there is no chance of a decoding or display discontinuity caused by padding. A disadvantage is that the decoding delay must be computed, and therefore the PCR and DTS of the data stream must be retrieved and decoded. This requires additional hardware and expense.

With either of the above schemes, the calculation of the number of null padding packets can be computed using the following definitions and assumptions.

Definitions:

B0: Video decoding buffer size at the end of old stream.

vbv_buffer_size: 1.75 Mb or 1835008 bit

T_pad: Duration of null padding bits.

At T_in point:

B0 - R_v * T_pad + (R_v' - R_v)*(decoding_delay-T_pad) ≤ vbv_buffer_size; and

T_pad ≥ decoding_delay*(1- R_v/R_v')-(vbv_buffer_size-B0)/R_v'.

Since B0 = decoding_delay*R_v, we have:

T_pad ≥ decoding-delay - vbv_buffer_size/R_v'.

Since decoding_delay < vbv_buffer/R_v, to simplify the computation, T_pad can be written as:

T_pad ≥ vbv_buffer_size*(1/R_v - 1/R_v').

For example, if R_v=4 Mbps and R_v'=8 Mbps, then the padding time will be:

T_pad = 1835008 * (1/4 - 1/8) = 0.23 sec.

However, this does not mean that the viewer will detect a discontinuity of 0.23 second. In fact, there will be no visible discontinuity when the data is displayed on a television screen since the 0.23 second delay only flushes out part of the data in the video decoding buffer. After 0.23 second, the data from the insertion stream will fill the buffer while the decoder is still decoding the data from the main stream. As long as the time to decode the remaining data in the video

decoding buffer is greater or equal to
(vbv_delay_of_first_picture - 1/picture_rate) of the insertion stream, there will be no decoding discontinuity.

Furthermore, at T_out, T_pad is computed as:

$$T\_pad \geq decoding\_delay - vbv\_buffer\_size/R\_v,$$

or simplified to:

$$T\_pad \geq vbv\_buffer\_size*(1/R\_v' - 1/R\_v).$$

The number of padding packets, N, can therefore be computed as:

$$L = T\_pad * R\_t/(188*8).$$

FIGURE 5 illustrates the processing flow of the Insertion Processing Unit of FIGURE 4 in accordance with tee present invention. Note that the steps of FIGURE 5 are shown as occurring in a sequential manner for clarity, but many of the steps may occur concurrently and/or sequentially. At block 502, the IPU outputs the main transport stream from the main stream buffer (MSB) 480. The IPU is essentially in a bypass mode at this time since the insertion stream has not yet been inserted. At block 506, the main stream parser parses the main stream to locate the splicing signal T_in. Note that T_in need not be carried in the main stream, but may be provided locally, for example, at a cable system headend. When T_in is detected, the IPU continues to output the main transport stream from the main stream buffer. At block 508, the main stream parser parses the main stream to locate the closest packet with an anchor picture (e.g., I or P picture) start code and passes that packet to the syntax processor 470. This packet will be the last packet of the main stream. To ensure that the resulting data stream is MPEG compliant, no data from the next frame or sequence of frames may be included in this last main stream packet. At block 512, the syntax processor adds a sequence end code field to the last packet of the main stream. The sequence end code is a twenty-four bit code which indicates the end of a sequence of pictures. At block 514, the PSI/PID replacer 435 starts to replace the PSI/PID of the insertion stream.

At block 516, the syntax processor processes the first packet of the insertion stream (e.g., the packet which contains the sequence start code) so that any data before the sequence start code in this packet that is coming from the insertion stream is replaced with stuffing bytes in the adaptation field. If the adaptation field does not exist, it is created. The packet's transport header and PES header are also modified to ensure that the output stream is MPEG compliant. The syntax processor also sets the discontinuity indicators of the insertion stream in ISB for all the packets before the PCR packet to "1".

At block 518, the video buffer manager 425 calculates the number, N, of null packets to pad. At block 520, at the end of the main stream, which is designated as the position sp_in, an interrupt signal, Main Stream Done (MSD), is generated. At block 522, after receiving the MSD signal, the IPU reads the null packets from the data buffer 435 and writes the null packets to the output stream. At block 524, at the end of the null packets, an interrupt signal, Null Packets Done (NPD), is generated.

At block 526, after receiving the NPD signal, the system begins to output data from the insertion stream buffer 490 at a position which is designated sp_in'. At the same time, the MSP reads from the main stream and puts a new sequence in the MSB.

At block 530, when T_out is detected, the processing continues at block 540. Otherwise, the system is in a waiting mode until T_out is received. At this time, the system continues to output data from the ISB. Generally, T_out may be provided locally, for example, by a cable system headend. However, it may be preferable for T_in and T_out to be provided in the main stream so that the cable headend is not tasked with managing the time and duration of the insertion. Moreover, the gap in the main stream in which the insertion stream is to be provided will not typically be controllable by the cable headend. At block 540, the ISP parses the insertion stream for the packet with an anchor picture start code and passes that packet to the syntax processor. This will be the last packet of the insertion stream. The syntax processor processes this last packet of the insertion stream so that there is no data from the next frame or sequence of frames included in the packet. Thus, the resulting data stream will be MPEG compliant. At block 544, the syntax processor adds a sequence end code field to the last packet of the insertion stream.

At block 546, the syntax processor processes the first packet of the main stream (which contains the sequence start code) so that any data before the sequence start code in this packet that is coming from main stream is replaced with zeros. The packet's transport header and PES header are also modified to ensure that the output stream is MPEG compliant. The syntax processor also sets the discontinuity indicators of the main stream in the MSB for all the packets before the PCR packet to "1".

At block 548, the video buffer manager calculates the number of null packets to pad. At block 550, at the end of IS, which is designated sp_out', an interrupt signal, Insertion Stream Done (ISD), is generated. At block 552, after receiving the ISD signal, the system reads the null packets from the data buffer and writes to the output stream. At block 554, at the end of the null packets, an interrupt signal, Null Packets Done (NPD), is generated. At block 556, after receiving the NPD signal, the system begins to read from the MSB at a point which is designated sp_out. Thus, at this time, the insertion stream ends and the next portion of the main stream begins to be output. At the same time, the ISP reads from the insertion stream and puts a new sequence in the ISB for future use. The process continues at block 506, where the MSP parses the main stream for the next splicing signal, T_in.

In practice, the invention is particularly suitable for inserting commercial messages into one or more network television programs. For example, often times a network program is transmitted via satellite to local cable system operators. The cable system operator has the task of inserting commercials from local businesses into the main stream. In this case, it may be desirable to provide commercials, for example, every twenty minutes. Furthermore, assume one commercial is inserted, and that the commercial has a duration of one minute. Then, for a network program which runs from 8:00 p.m. to 9:00 p.m., we may have T_in=8:00 p.m., T_out=8:01 p.m., then T_in=8:20 p.m., T_out=8:21 p.m., and finally T_in=8:59 p.m., T_out=9:00 p.m. Other variations are possible, of course. For example, a prerecorded series of commercials may be assembled. In this case, the beginning of the first commercial will correspond to T_in, and the end of the last commercial may correspond to T_out. Alternatively, the network program may include one or more commercials already in the main transport stream. In this case, the present invention may be used to replace selected ones of the main stream commercials, or to remove selected ones of the commercials without replacement. Note that the latter case may not be possible in real-time.

In order to implement the processing flow of FIGURE 5, the structure of a packetized data stream must be examined in greater detail. In a packetized digital data stream, typically the packets carrying the compressed video data will be multiplexed with other packets, e.g., carrying corresponding audio data and control information necessary to reconstruct a television signal. One standard for transporting digital television signals in this manner is the MPEG-2 standard, details of which can found in document AVC-491, version 1, April, 1993, published by the Telecommunications Standardization Sector, Study Group 15, Experts Group 4ATM-Video Coding of the International Organization for Standardization, ISO-IEC/JTC1/SC29/WG11 entitled "Coded Representation of Picture and Audio Information," incorporated herein by reference; ISO/IEC 13818-2, March 25, 1994, entitled "Generic Coding of Moving Pictures and Associated Audio," incorporated herein by reference; and ISO/IEC 13818-1, April 27, 1995, entitled "Coding of Audio, Picture, Multimedia and Hypermedia Information," incorporated herein by reference. Further details of the video syntax and semantics for MPEG-2 video can be found in International Organization for Standardization document ISO/IEC 11172-6 dated April 2, 1993 and entitled "Revised Syntax and Semantics for MPEG-2 Video," also incorporated herein by reference. Also of interest, and incorporated herein by reference, is document MC68VDP/D, a preliminary data sheet entitled "MPEG-2/DCII Video Decompression Processor," ©Motorola Microprocessor and Memory Technologies Group, 1994 which describes a video decompression processor using the MPEG-2 and DigiCipher®II standards.

In the MPEG-2 system (and the similar DigiCipher® II system proprietary to General Instrument Corporation, the assignee hereof) a transport stream, or transport multiplex is made up of a contiguous set of fixed length packets. Each packet is 188 total bytes in length, with the first four of those bytes being defined as the packet header. The payload portion of each packet is thus normally 184 bytes. However, a variable length adaptation field may be provided to extend the header, when required. When an adaptation field is present, the payload portion of the packet will be correspondingly shorter.

Various timing and identification information is provided in different portions of the transport stream. These include a packet identifier (PID) found in the transport header of each transport packet to provide a reference number for identifying the transport packets carrying a specific service component. This number is included in a service definition or "service map" used by the receiver to identify those transport packets required to reconstruct a television program signal. The PID may also be referenced for various grooming and remultiplexing functions. In the case of video, audio or isochronous control data, the stream of packets labeled with a single PID represents a single video, audio or isochronous data service elementary stream, respectively. Each type of packet will have a different PID identifying the packet type.

Timing information carried by the transport stream includes a program clock reference (PCR) which effectively represents a sample of the system time clock (STC) time base that underlies the service composed of the PIDs referenced in the service map. The PID carrying the packet with the PCR is also referenced in the service map. The video, audio and isochronous data components of a service are locked through a defined relationship to the system time clock. The PCR serves to define the transport rate, in the sense that between any two successive PCRs in one PID, the transport rate is constant and nominally equal to the system time clock rate times the ratio of the total number of transport bytes between the PCRs divided by the difference in the PCRs in units of system time clock ticks.

The timing information carried by the transport stream also includes time stamps for the commencement of decoding and presentation of data for display. The presentation time stamp (PTS) is used for service component acquisition and also for evaluating whether timing and buffer control are operating properly at the decoder. The decoder time stamp (DTS) is used to indicate when the decoder should start to decode the first access unit (e.g., video frame) that starts in the payload of a packetized elementary stream (PES) packet whose header includes the DTS. A packetized elementary stream is a data stream composed of end-to-end PES packets which have variable length and are typically far longer than a fixed length transport packet. Thus, a PES packet is typically composed of data from a plurality of transport packets.

FIGURES 6a to 6c are diagrammatic illustrations showing how variable length PES packets are reorganized into fixed length transport packets for use in providing a transport multiplex for transmission. FIGURE 6a illustrates a portion

of a packetized elementary stream carrying successive PES packets, each having a header (PES-HDR) 672 and a PES payload 674. The PES packets 670 are of variable length. PES packets are typically several thousand bytes in length. They are required to be aligned in such a manner that, when divided into transport packet payloads, the first byte of every PES header is located in the first payload position of some transport packet. For any transport packet carrying the aligned PES header, a "payload unit start indicator" will be set in the transport header for the transport packet. In the MPEG-2 and DigiCipher® II systems, the PES format is used for all service components that are inherently synchronous. More particularly, video, audio and isochronous data components are carried as packetized elementary streams, and the PES headers 672 will carry various information necessary to define the payload, including a packet start code prefix, a stream identification, and a PES packet length.

The header may also contain a presentation time stamp (PTS) or decode time stamp (DTS). The PTS is a field which indicates the value that corresponding bytes of the decoder system time clock reference should have when the first presentation unit (i.e., video frame, audio sync frame, isochronous data access unit) whose access unit starts somewhere in the payload of this PES packet is presented. For video, an access unit starts if the first byte of the picture start code is present in the payload of the PES packet. For audio, an access unit starts if the first byte of the sync word is present in the payload of this PES packet. For isochronous data, an access unit starts if the first byte of the data header is present in the payload of this PES packet. The PTS field is used for service component acquisition, and also for evaluating whether timing and buffer control are operating properly at the decoder.

The DTS is a field indicating what value corresponding bits of the decoder system time clock reference should have when the decoder starts to decode the first access unit that starts somewhere in the payload of this PES packet. The PTS and DTS differ only for video, and only in the case of the I-frame and the P-frames transmitted with B-frames.

The PES payload contains the information data that is desired to be transmitted to a receiver. Thus, the payload includes all of the video, audio and control information necessary for the receiver to decode and reconstruct, e.g., a digital television signal.

In order to meet the requirements of robustness and simplicity, a fixed packet length approach is preferred to the variable length PES packets. Thus, as illustrated in FIGURE 6b, the packet elementary stream containing the PES packets 670 is reconfigured into a stream of fixed length transport packets 680. The transport packets illustrated in FIGURE 6b all correspond to the same service component, such as the video component of a digital television transmission. In the MPEG-2 and DigiCipher® II embodiments, each packet is 188 total bytes in length, with the first four bytes comprising a transport packet header (TP HDR) 682. The payload portion 684 of each packet 680 is thus normally 184 bytes. However, an adaptation field mechanism is present, as illustrated by transport packet 680', to extend the header when required. The adaptation field 686 provides additional information which is not required for every transport packet. The adaptation field (ADPT FIELD) 686 extends the regular transport header 682 at the expense of payload 684, which will be less than 184 bytes whenever the adaptation is provided. The adaptation field 686 is of variable length, depending on the information it contains. Typically, the adaptation field will support additional information for time base recovery and other functions, and also provides a mechanism for padding the payload when it does not occupy the full 184 bytes. Such padding can be used, for example, to make a variable rate video packetized elementary stream into a constant rate transport stream.

As indicated in FIGURE 6b, the transport header of each transport packet includes the PID which identifies the particular service component carried by the transport packet. The PCR will be carried by an adaptation field to provide timing information for a desired service. At a receiver, the PCR for the desired service is detected from the adaptation field. The PIDs of the transport packets will then be monitored in accordance with the timing established by the PCR to recover those transport packets carrying a particular component of the service to be processed.

Transport packets from various service components are multiplexed into a transport multiplex 690 as illustrated in FIGURE 6c. The transport multiplex will carry interspersed packets from each of the different components (e.g., video, audio and control) necessary to reconstruct a service at the receiver. In the illustrative transport multiplex shown in FIGURE 6c, video transport packets 680 (A_1, A_2, A_3...) are followed by audio components 692 (B_1, B_2, B_3...) which, in turn, are followed by control component packets 694 (C_1, C_2, C_3...).

With the foregoing in mind, the operation of the syntax processor 470 of the IPU 400 in fixing the packets of the main stream or the insertion can now be discussed. First, the process of blocks 508 and 540 will be discussed, wherein the last packet of the main or insertion stream, respectively, before the splicing point, is processed to maintain compliance with an MPEG or similar communication protocol. The splicing point is the boundary between the main and insertion stream packets. This corresponds to the point between sp_in of the main stream and sp_in' of the insertion stream when the output stream transitions from the main to the insertion stream, or to the point between sp_out' of the insertion stream and sp_out of the main stream when the output stream transitions from the insertion to the main stream.

Generally, the last packet of the data stream before the splicing point has to be processed since the transport packet boundary may not be the same as the picture boundary. This last packet will be referred to as a pre-splicing data packet. In this case, the pre-splicing packet will contain part of the data from the next (anchor) frame. The pre-splicing packet can be fixed by discarding the data from the next frame and stuffing the same amount of bytes to the adaptation

field of the last packet, where it is understood that stuffing bytes are simply dummy bytes of data. If an adaptation field does not exist in the last packet, it can be created. Note that after fixing the information contained in the adaptation_field and pes_hdr, including adaptation_field_length, payload_unit_start_indicator, pes_length, and other parameters, may be changed. However, this is not expected to result in any visible discontinuity or artifacts to the viewer when the data is displayed.

Processing of the pre-splicing packet is treated differently depending on whether the packet has an adaptation field and a PES header, and further depending on the location of data fields in the packet. FIGURES 7a-7d show a pre-splicing data packet having an adaptation field and PES header before and after processing in accordance with the present invention.

In FIGURE 7a, the packet, shown generally before processing at 700, includes a transport header 701, an adaptation field 702 carrying K bytes, a first data field 703, a PES header (pes_hdr) 704, a second data field 705, a picture start code 706 carrying four bytes, and a third data field 707 carrying M bytes. In this case, it can be seen that there is data carried in the packet 700 between the adaptation_field 702 and the pes_hdr 704, and between the pes_hdr 704 and the pic_start_code 706.

Moreover, since the pic_start_code 706 defines the start of a new picture or frame, it can be seen that the third data field 707 carries data of the new frame. Thus, in accordance with the present invention, the packet 700 is processed by discarding the data of the pic_start_code 706 and the associated third data field 707, and stuffing 4+M dummy bytes in the adaptation field 702. This results in the processed packet 710 which includes the adaptation field 712, and which terminates with the second data field 705. The packet 710 includes data from only one picture and does not require the next adjacent packet to maintain continuity.

Note that in FIGURES 7-11, the relative width of a packet or a field thereof does not necessarily indicate the amount of data carried in the field or the packet.

In FIGURE 7b, the unprocessed packet is shown generally at 720, and the processed packet is shown generally at 730. Here, there is data between the adaptation_field 702 and the pes_hdr 704, but not between the pes_hdr 704 and the pic_start_code 706. In accordance with the present invention, the packet 720 is processed by discarding the data of the pes_hdr 704, pic_start_code 706 and the third data field 707, and stuffing N+4+M dummy bytes in the adaptation field 702. This results in the processed packet 730 which includes the adaptation field 732, and which terminates with the first data field 703.

In FIGURE 7c, the unprocessed packet is shown generally at 740, and the processed packet is shown generally at 750. Here, there is data between the pes_hdr 704 and the pic_start_code 706, but not between the adaptation_field 702 and the pes_hdr 704. In accordance with the present invention, the packet 740 is processed by discarding the data of the pic_start_code 706 and the third data field 707, and stuffing 4+M dummy bytes in the adaptation field 702. This results in the processed packet 750 which includes the adaptation field 752, and which terminates with the second data field 705.

In FIGURE 7d, the unprocessed packet is shown generally at 760. Here, there is no data field between the pes_hdr 704 and the pic_start_code 706, or between the adaptation_field 702 and the pes_hdr 704. In accordance with the present invention, as shown at 770, the entire packet 760 is not transmitted since there would be no data fields remaining after discarding the third data field 707.

FIGURES 8a and 8b show a pre-splicing data packet having an adaptation field but no PES header before and after processing in accordance with the present invention. In FIGURE 8a, the unprocessed packet is shown generally at 800, and the processed packet is shown generally at 810. Here, there is data between the adaptation field 802 and the pic_start_code 804. In accordance with the present invention, the packet 800 is processed by discarding the data of the pic_start_code 804 and the second data field 805, and stuffing 4+M dummy bytes in the adaptation field 802. This results in the processed packet 810 which includes the adaptation field 812, and which terminates with the first data field 803.

In FIGURE 8b, the unprocessed packet is shown generally at 820. Here, there is no data field between the adaptation field 802 and the pic_start_code 804. In accordance with the present invention, as shown at 830, the entire packet 820 is not transmitted since there would be no data fields remaining after discarding the second data field 805.

FIGURES 9a-9d show a pre-splicing data packet having no adaptation field but with a PES header before and after processing in accordance with the present invention. In this case, an adaptation field is created which carries the dummy stuffing bits which account for the discarded fields. In FIGURE 9a, the packet, shown generally before processing at 900, includes a transport header 901, a first data field 902, a PES header 903, a second data field 904, a picture start code 905 carrying four bytes and a third data field 906 carrying M bytes. In this case, data is carried between the tp_hdr 901 and the pes_hdr 903, and between the pes_hdr 903 and the pic_start_code 905. In accordance with the present invention the packet 900 is processed by discarding the data of the pic_start_code 905 and the third data field 906, and creating an adaptation field 912 with 4+M dummy bytes as shown in the processed packet 910.

In FIGURE 9b, the unprocessed packet is shown generally at 920, and the processed packet is shown generally at 930. Here, there is data between the tp_hdr 901 and the pes_hdr 903, but not between the pes_hdr 903 and the

pic_start_code 905. In accordance with the present invention, the packet 920 is processed by discarding the data of the pes_hdr 903, pic_start_code 905, and the third data field 906, and creating an adaptation field 932 with N+4+M dummy bytes, as shown in the processed packet 930.

In FIGURE 9c, the unprocessed packet is shown generally at 940, and the processed packet is shown generally at 950. Here, there is data between the pes_hdr 903 and the pic_start_code 905, but not between the tp_hdr 901 and the pes_hdr 903. In accordance with the present invention, the packet 940 is processed by discarding the data of the pic_start_code 905 and the third data field 906, and creating an adaptation field 952 with 4+M dummy bytes, as shown in the processed packet 950.

In FIGURE 9d, the unprocessed packet is shown generally at 960. Here, there is no data field between the tp_hdr 901 and the pes_hdr 903, or between the pes_hdr 903 and the pic_start_code 905. In accordance with the present invention, as shown at 970, the entire packet 960 is not transmitted since there would be no data fields remaining after discarding the third data field 906.

FIGURES 10a and 10b show a pre-splicing data packet having no adaptation field or PES header before and after processing in accordance with the present invention. In this case, an adaptation field is created which carries the dummy stuffing bits which account for the discarded fields. In FIGURE 10a, the unprocessed packet is shown generally at 1000, and the processed packet is shown generally at 1010. Here, there is data between the tp_hdr 1001 and the pic_start_code 1003. In accordance with the present invention, the packet 1000 is processed by discarding the data of the pic_start_code 1003 and the second data field 1004, and creating an adaptation field 1012 with 4+M dummy bytes, as shown in the processed packet 1010.

In FIGURE 10b, the unprocessed packet is shown generally at 1020. Here, there is no data field between the tp_hdr 1001 and the pic_start_code 1003. In accordance with the present invention, as shown at 1030, the entire packet 1020 is not transmitted since there would be no data fields remaining after discarding the second data field 1004.

Now, the process of blocks 516 and 546 will be discussed, wherein the first packet of the main stream after the second splicing point (e.g., sp_out), is processed to maintain compliance with the MPEG or similar communication protocol. This first packet will be referred to as a post-splicing data packet. As with the pre-splicing packet, processing of the post-splicing packet is treated differently depending on whether the packet has an adaptation field and a PES header, and further depending on the location of data fields in the packet. In particular, the first post-splicing packet must be processed by the syntax processor 470 when the splicing point does not correspond exactly to a picture boundary. In this case, the post-splicing packet may contain part of the data from a previous picture or sequence of pictures.

In accordance with the present invention, the post-splicing packet is fixed by discarding the data from the previous sequence and stuffing a compensating number of dummy bytes to the adaptation field of the post-splicing packet. Furthermore, an adaptation field is created if it does not already exist. Moreover, as with the processing of the pre-splicing packet, the information contained in the adaptation_field and pes_hdr, including
adaptation_field_length,
payload_unit_start_indicator, pes_length, and other parameters, may be changed, but this is no expected to result in any visible discontinuity or artifacts to the viewer when the data is displayed.

FIGURES 11a-11d show a post-splicing data packet having an adaptation field and PES header before and after processing in accordance with the present invention. In FIGURE 11a, the packet, shown generally before processing at 1100, includes a transport header 1101, an adaptation field 1102 carrying K bytes, a first data field 1103 carrying N bytes, a PES header, pes_hdr 1104, a second data field 1105 carrying M bytes, a sequence start code 1106 and a third data field 1107. In this case, it can be seen that there is data carried between the adaptation_field 1102 and the pes_hdr 1104, and between the pes_hdr 1104 and the seq_start_code 1106.

Moreover, the seq_start_code 1106 defines the start of a new sequence of pictures, and the first data field 1103 and the second data field 1105 carry data of a picture from a previous sequence. Thus, in accordance with the present invention the packet 1100 is processed by discarding the first data field 110 and the second data field 1105, and stuffing N+M dummy bytes in the adaptation field 1102. This results in the processed packet 1110 which includes the adaptation field 1112. The packet 1110 includes data from only one sequence of pictures and does not require the previous adjacent packet to maintain continuity.

In FIGURE 11b, the unprocessed packet is shown generally at 1120, and the processed packet is shown generally at 1130. Here, there is data between the adaptation_field 1102 and the pes_hdr 1104, but not between the pes_hdr 1104 and the seq_start_code 1106. In accordance with the present invention, the packet 1120 is processed by discarding the first data field 1103, and stuffing N dummy bytes into the adaptation field 1102. This results in the processed packet 1130 which includes the adaptation field 1132.

In FIGURE 11c, the unprocessed packet is shown generally at 1140, and the processed packet is shown generally at 1150. Here, there is data between the pes_hdr 1104 and the seq_start_code 1106, but not between the adaptation_field 1102 and the pes_hdr 1104. In accordance with the present invention, the packet 1140 is processed by discarding the second data field 1105, and stuffing M dummy bytes in the adaptation field 1102. This results in the processed packet 1150 which includes the adaptation field 1152.

In FIGURE 11d, the unprocessed packet is shown generally at 1160. Here, there is no data field between the pes_hdr 1104 and the seq_start_code 1106, or between the adaptation_field 1102 and the pes_hdr 1104. In accordance with the present invention, the entire packet 1160 is transmitted without modification since there is no data field prior to the seq_start_code 1106.

FIGURES 12a and 12b show a post-splicing data packet having an adaptation field but no PES header before and after processing in accordance with the present invention. In FIGURE 12a, the unprocessed packet is shown generally at 1200, and the processed packet is shown generally at 1210. Here, there is data between the adaptation field 1202 and the seq_start_code 1204. In accordance with the present invention, the packet 1200 is processed by discarding the first data field 1203 and stuffing N dummy bytes in the adaptation field 1202. This results in the processed packet 1210 which includes the adaptation field 1212.

In FIGURE 12b, the unprocessed packet is shown generally at 1220. Here, there is no data field between the adaptation field 1202 and the seq_start_code 1204. In accordance with the present invention, the entire packet 1220 is transmitted without modification since there is no data field prior to the seq_start_code 1204.

FIGURES 13a-13d show a post-splicing data packet having no adaptation field but with a PES header before and after processing in accordance with the present invention. In FIGURE 13a, the packet, shown generally before processing at 1300, includes a transport header 1301, a first data field 1302 carrying N bytes, a PES header 1303, a second data field 1304 carrying M bytes, a sequence start code 1305 and a third data field 1306. In this case, it can be seen that there is data carried in the packet 1300 between the tp_hdr 1301 and the pes_hdr 1303, and between the pes_hdr 1303 and the seq_start_code 1305. In accordance with the present invention the packet 1300 is processed by discarding the first data field 1302 and the second data field 1304, and creating an adaptation field 1312 with N+M dummy bytes as shown in the processed packet 1310.

In FIGURE 13b, the unprocessed packet is shown generally at 1320, and the processed packet is shown generally at 1330. Here, there is data between the tp_hdr 1301 and the pes_hdr 1303, but not between the pes_hdr 1303 and the seq_start_code 1305. In accordance with the present invention, the packet 1320 is processed by discarding the first data field 1302, and creating an adaptation field 1322 with N dummy bytes, as shown in the processed packet 1330.

In FIGURE 13c, the unprocessed packet is shown generally at 1340, and the processed packet is shown generally at 1350. Here, there is data between the pes_hdr 1303 and the seq_start_code 1305, but not between the tp_hdr 1301 and the pes_hdr 1303. In accordance with the present invention, the packet 1340 is processed by discarding the second data field 1304, and creating an adaptation field 1352 with M dummy bytes, as shown in the processed packet 1350.

In FIGURE 13d, the unprocessed packet is shown generally at 1360. Here, there is no data field between the tp_hdr 1301 and the pes_hdr 1303, or between the pes_hdr 1303 and the seq_start_code 1305. In accordance with the present invention, the entire packet 1360 is transmitted without modification since there is no data field prior to the seq_start_code 1305.

FIGURES 14a and 14b show a post-splicing data packet having no adaptation field or PES header before and after processing in accordance with the present invention. In this case, an adaptation field is created which carries the dummy stuffing bits which account for the discarded fields. In FIGURE 14a, the unprocessed packet is shown generally at 1400, and the processed packet is shown generally at 1410. Here, there is data between the tp_hdr 1401 and the seq_start_code 1403. In accordance with the present invention, the packet 1400 is processed by discarding the first data field 1402, and creating an adaptation field 1412 with N dummy bytes, as shown in the processed packet 1410.

In FIGURE 14b, the unprocessed packet is shown generally at 1420. Here, there is no data field between the tp_hdr 1401 and the seq_start_code 1403. In accordance with the present invention, the entire packet 1420 is transmitted without modification since there is no data field prior to the seq_start_code 1403.

A decoder for decoding the output data stream may be provided as discussed earlier in connection with FIGURE 1. For example, the Digital Entertainment Terminal (DET) 168 can include a decoder with an associated data buffer and processor. The buffer receives the incoming data stream and provides the data to the processor for decoding and other processing which is required to provide a signal suitable for reproduction on a television. As discussed, the provision of null packets in the output data stream will prevent a potential buffer overflow at the decoder.

Accordingly, it can be seen that the present invention provides a method and apparatus for splicing compressed packetized digital video streams. In particular, a secondary packetized data stream, such as a commercial, is spliced with a primary packetized data stream, such as a network television program. The system does not require the decompression of the data in the primary data stream, and is particularly suitable for use at a cable system headend to allow the insertion of commercials from local businesses into a nationally broadcast television program.

Although the invention has been described in connection with various specific embodiments, those skilled in the art will appreciate that numerous adaptations and modifications may be made thereto without departing from the spirit and scope of the invention as set forth in the claims. For example, it is possible to locate the IPU in the decoder at the subscriber's home, thereby providing the subscriber with the capabilities of a in-home digital data mixer such as those used at television, radio and recording studios. This would allow the subscriber to edit various audio, video and data sources.

For example, data stored on a DVD or CD-ROM could be spliced with a main program for various educational and entertainment purposes.

Claims

1. A method for splicing a secondary packetized data stream with a primary packetized data stream, comprising the steps of:

   providing a start signal indicating a time to initiate said splicing;
   determining a pre-splicing packet of said primary stream according to said start signal; and
   providing an output stream where a first packet of said secondary stream is positioned to follow said pre-splicing packet.

2. A method in accordance with claim 1, wherein the packets of said primary stream have identifying data associated therewith, comprising the further steps of:

   retrieving said identifying data of said primary stream; and
   providing said secondary stream with said identifying data.

3. A method in accordance with claim 1 or 2, comprising the further steps of:

   providing a number L of null packets in said output stream to prevent a buffer overflow at a decoder which receives said output stream; and
   inserting said null packets between said pre-splicing packet and said first packet;
   wherein said number L is determined according to respective data rates of said primary and secondary streams.

4. A method in accordance with one of the preceding claims, comprising the further steps of:

   determining a post-splicing packet of said primary stream which follows said pre-splicing packet;
   discarding data of said pre-splicing packet which is associated with said post-splicing packet; and
   adding an amount of stuffing data to said pre-splicing packet according to the amount of data discarded.

5. A method in accordance with one of the preceding claims, wherein said pre-splicing packet is a packet of said primary stream with an anchor frame start code which is closest to said start time.

6. A method in accordance with one of the preceding claims, wherein said primary stream carries compressed digital data, and said splicing does not require decompression of said compressed digital data.

7. A method in accordance with one of the preceding claims, comprising the further steps of:

   determining a post-splicing packet of said primary stream which follows said pre-splicing packet; and
   positioning said post-splicing packet to follow a last packet of said secondary stream in said output stream.

8. A method in accordance with claim 7, comprising the further steps of:

   discarding data of said post-splicing packet which is associated with a packet of said primary stream which immediately precedes said post-splicing packet; and
   adding an amount of stuffing data to said post-splicing packet according to the amount of data discarded.

9. A method in accordance with claim 7 or 8, wherein said post-splicing packet is a packet of said primary stream with a sequence start code which directly follows a sequence end code which is associated with said last packet of said secondary stream.

10. An apparatus for splicing a secondary packetized data stream with a primary packetized data, comprising:

    means for providing a start signal indicating a time to initiate said splicing;
    means for determining a pre-splicing packet of said primary stream according to said start signal; and

means for providing an output stream where a first packet of said secondary stream is positioned to follow said pre-splicing packet.

11. An apparatus in accordance with claim 10, wherein the packets of said primary stream have identifying data associated therewith, further comprising:

means for retrieving said identifying data of said primary stream; and
means for providing said secondary stream with said identifying data.

12. An apparatus in accordance with claim 10 or 11, further comprising:

means for providing a number L of null packets in said output stream to prevent a buffer overflow at a decoder which receives said output stream; and
means for inserting said null packets between said pre-splicing packet and said first packet;
wherein said number L is determined according to respective data rates of said primary and secondary streams.

13. An apparatus in accordance with one of claims 10 to 12, further comprising:

means for determining a post-splicing packet of said primary stream which follows said pre-splicing packet;
means for discarding data of said pre-splicing packet which is associated with said post-splicing packet; and
means for adding an amount of stuffing data to said pre-splicing packet according to the amount of data discarded.

14. An apparatus in accordance with one of claims 10 to 13, wherein said pre-splicing packet is a packet of said primary stream with an anchor frame start code which is closest to said start time.

15. An apparatus in accordance with one of claims 10 to 14, wherein said primary stream carries compressed digital data, and said splicing does not require decompression of said compressed digital data.

16. An apparatus in accordance with one of claims 10 to 15, further comprising:

means for determining a post-splicing packet of said primary stream which follows said pre-splicing packet; and
means for positioning said post-splicing packet to follow a last packet of said secondary stream in said output stream.

17. An apparatus in accordance with claim 16, further comprising:

means for discarding data of said post-splicing packet which is associated with a packet of said primary stream which immediately precedes said post-splicing packet; and
means for adding an amount of stuffing data to said post-splicing packet according to the amount of data discarded.

18. An apparatus in accordance with claim 16 or 17, wherein said post-splicing packet is a packet of said primary stream with a sequence start code which directly follows a sequence end code which is associated with said last packet of said secondary stream.

19. A decoder for decoding a transport data stream which comprises a secondary packetized data stream which is spliced with a primary packetized data stream, wherein a first packet of said secondary stream is positioned to follow a pre-splicing packet of said primary stream, said decoder comprising:

a buffer for storing said transport data; and
a processor coupled to receive data from said buffer for processing said transport data; wherein:
a number L of null packets are provided between said pre-splicing packet and said first packet to prevent overflow of said buffer; and
said number L is determined according to respective data rates of said primary and secondary streams.

20. A decoder in accordance with claim 19, wherein said number L is determined according to a decoding delay time of said decoder.

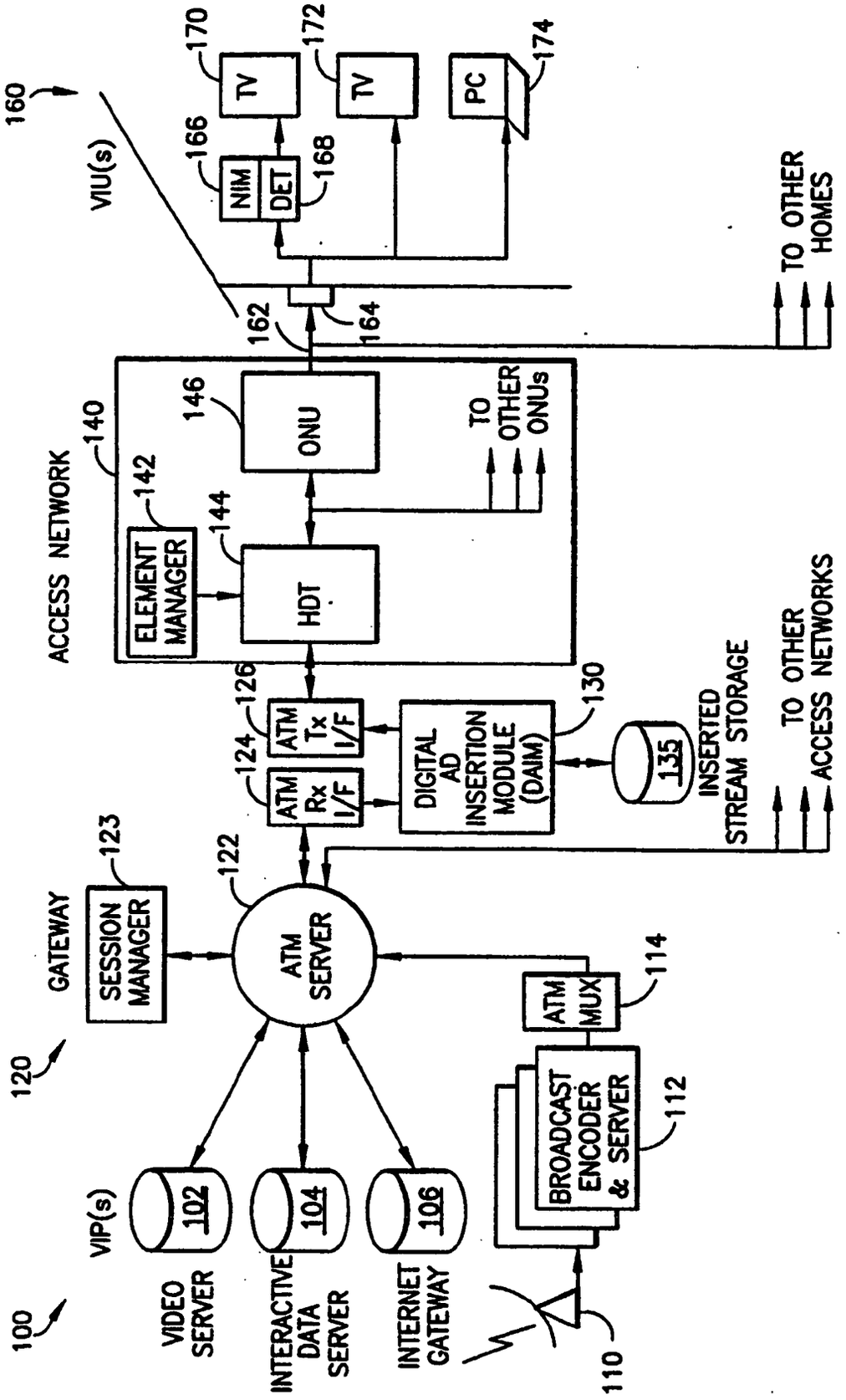
100
120
GATEWAY
SESSION MANAGER
123
122
ATM SERVER
ATM MUX
114
BROADCAST ENCODER & SERVER
112
110
VIP(s)
VIDEO SERVER
102
INTERACTIVE DATA SERVER
104
INTERNET GATEWAY
106
ATM Rx I/F
124
ATM Tx I/F
126
DIGITAL AD INSERTION MODULE (DAIM)
130
135
INSERTED STREAM STORAGE
TO OTHER ACCESS NETWORKS
ACCESS NETWORK
140
ELEMENT MANAGER
142
144
HDT
146
ONU
TO OTHER ONUs
160
VIU(s)
162
164
TO OTHER HOMES
166
NIM
DET
168
170
TV
172
TV
174
PC

FIG. 1

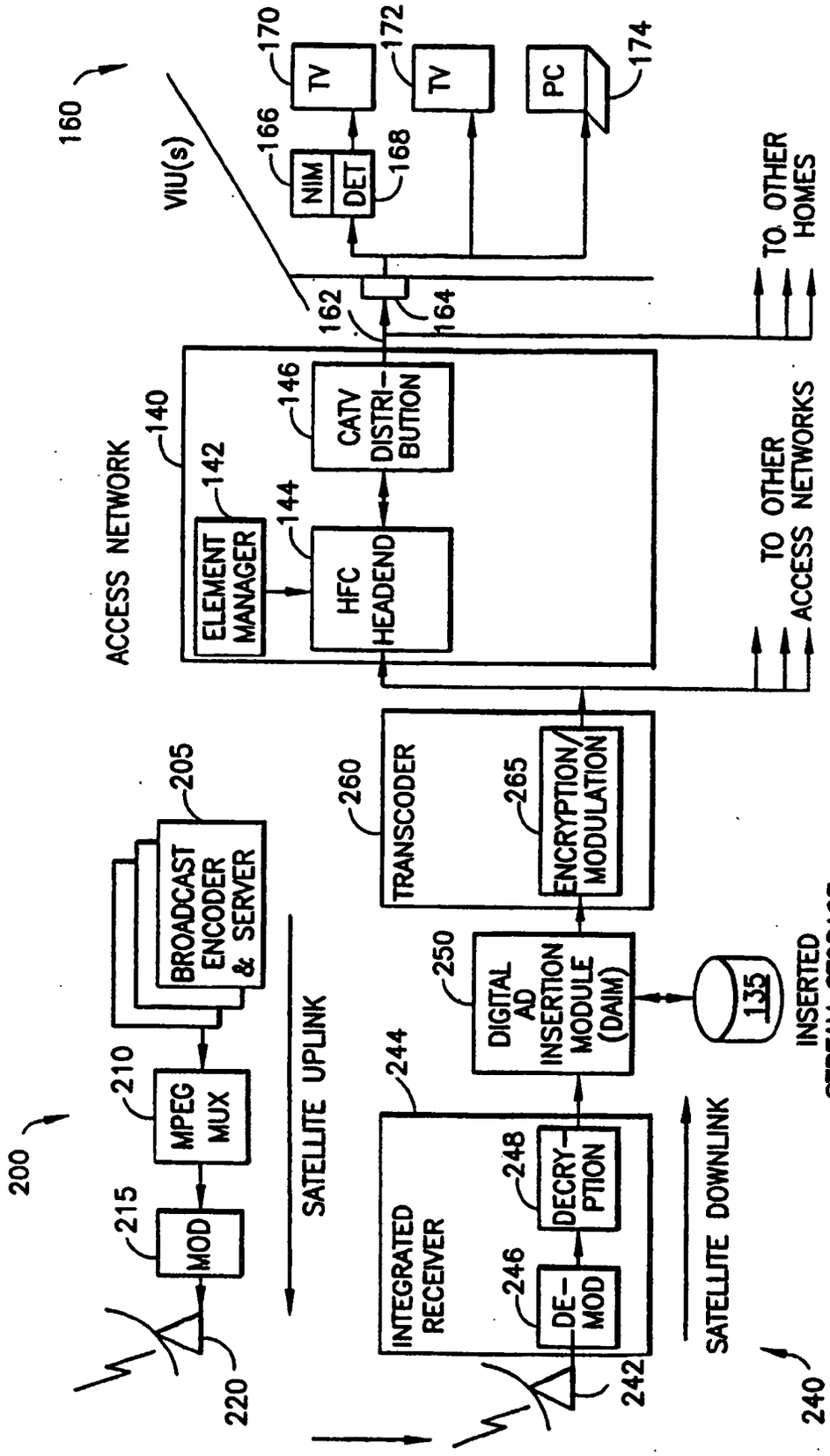
160
VIU(s)
170
TV
172
TV
174
PC
166
NIM
168
DET
TO OTHER HOMES
162
164
ACCESS NETWORK
140
142
ELEMENT MANAGER
144
HFC HEADEND
146
CATV DISTRI-BUTION
TO OTHER ACCESS NETWORKS
260
TRANSCODER
265
ENCRYPTION/ MODULATION
205
BROADCAST ENCODER & SERVER
210
MPEG MUX
215
MOD
200
SATELLITE UPLINK
250
DIGITAL AD INSERTION MODULE (DAIM)
135
INSERTED STREAM STORAGE
244
INTEGRATED RECEIVER
248
DECRY-PTION
246
DE-MOD
220
242
SATELLITE DOWNLINK
240

FIG.2

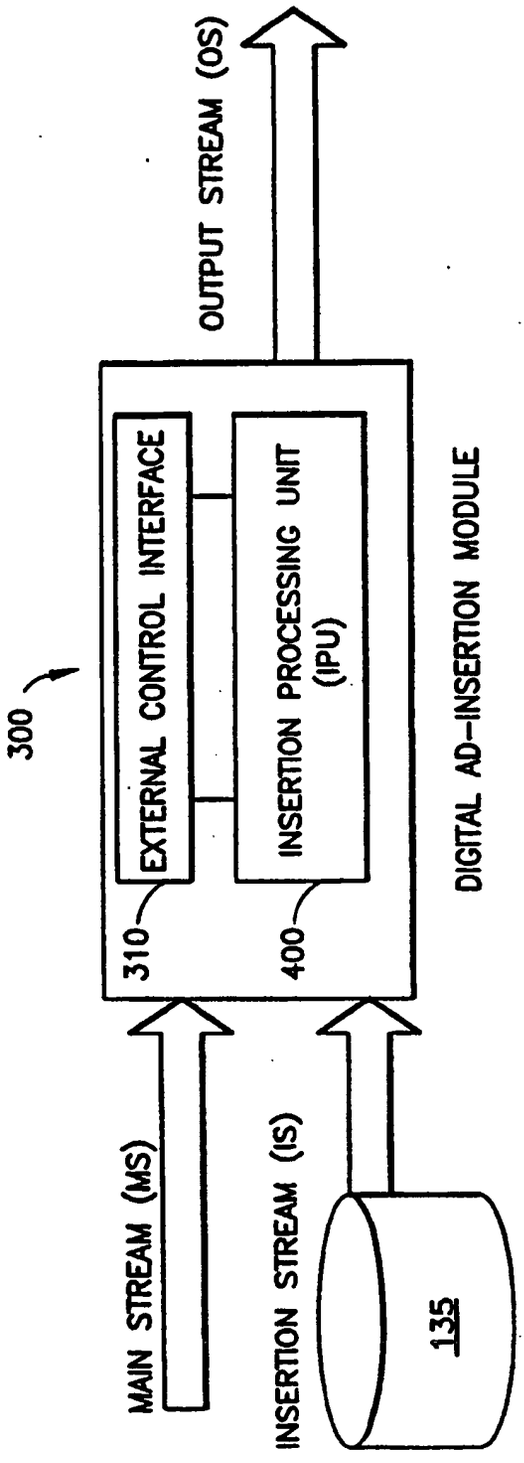
300
EXTERNAL CONTROL INTERFACE
310
INSERTION PROCESSING UNIT (IPU)
400
DIGITAL AD-INSERTION MODULE
OUTPUT STREAM (OS)
MAIN STREAM (MS)
INSERTION STREAM (IS)
135

FIG.3

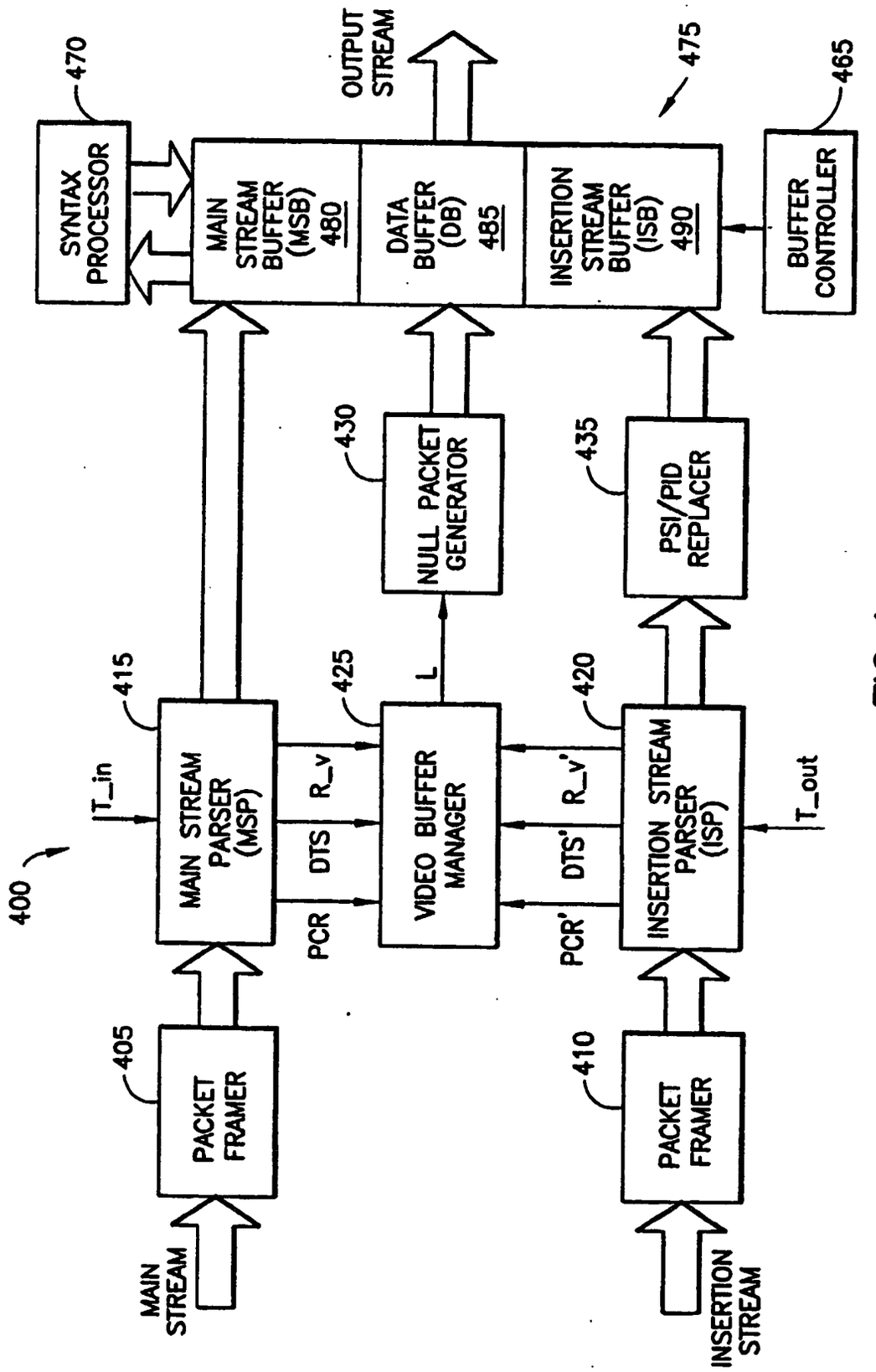
400
SYNTAX PROCESSOR
470
MAIN STREAM BUFFER (MSB) 480
DATA BUFFER (DB) 485
INSERTION STREAM BUFFER (ISB) 490
OUTPUT STREAM
475
BUFFER CONTROLLER
465
NULL PACKET GENERATOR
430
PSI/PID REPLACER
435
MAIN STREAM PARSER (MSP)
415
VIDEO BUFFER MANAGER
425
INSERTION STREAM PARSER (ISP)
420
T_in
R_v
DTS
PCR
L
R_v'
DTS'
PCR'
T_out
PACKET FRAMER
405
PACKET FRAMER
410
MAIN STREAM
INSERTION STREAM

FIG.4

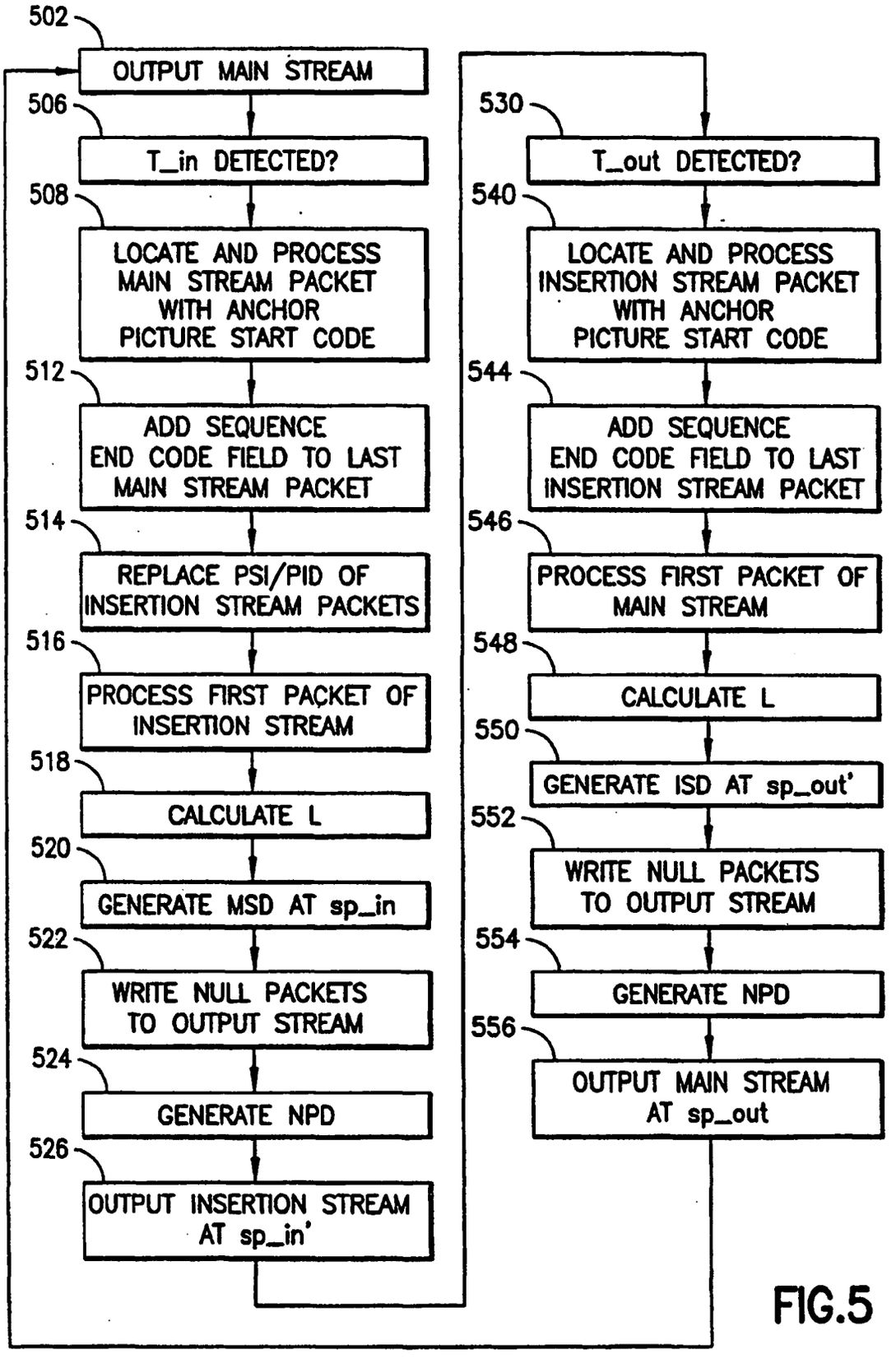

FIG.5

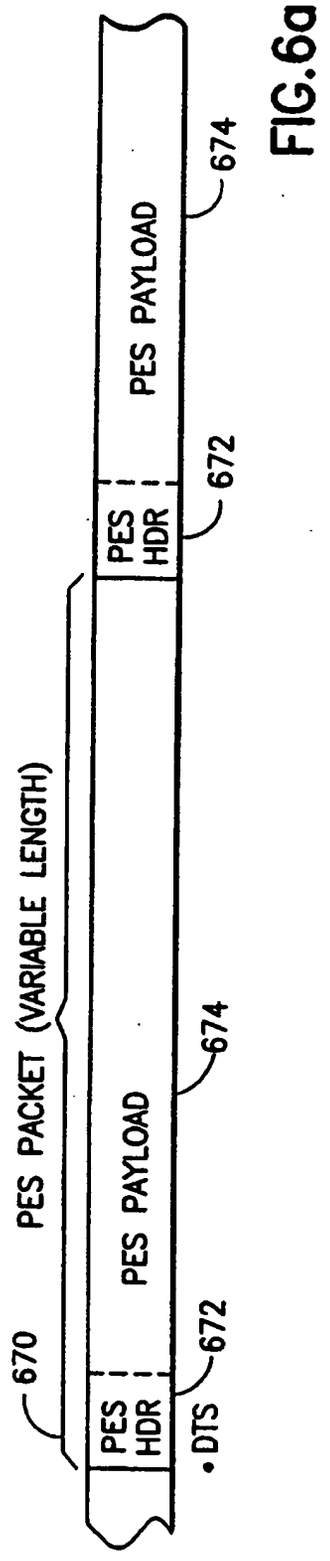

FIG.6a

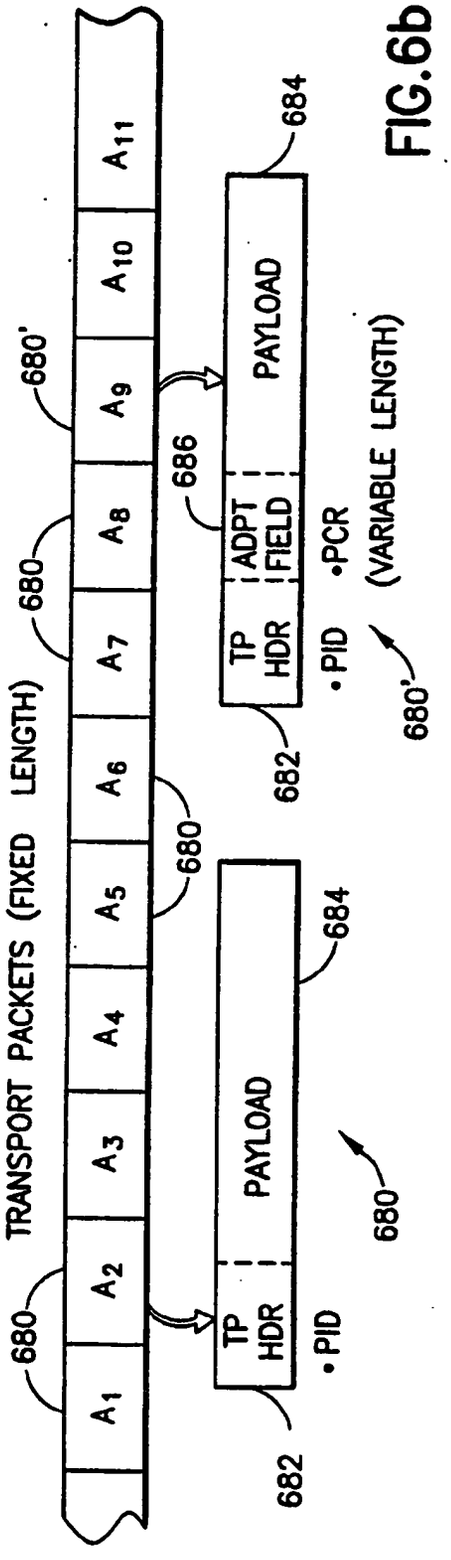

FIG.6b

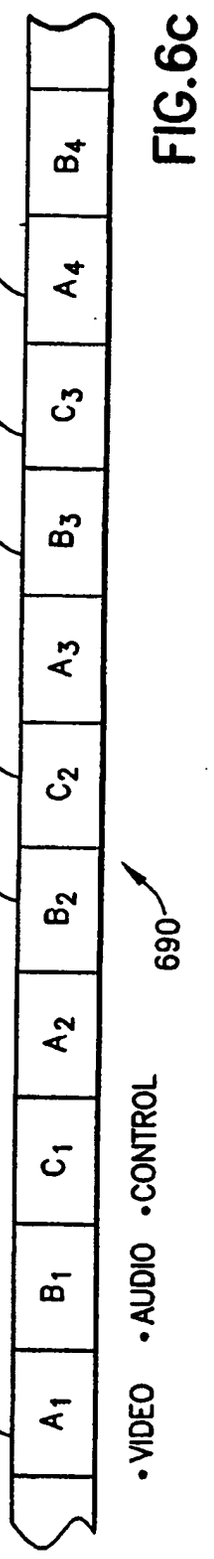

FIG.6c

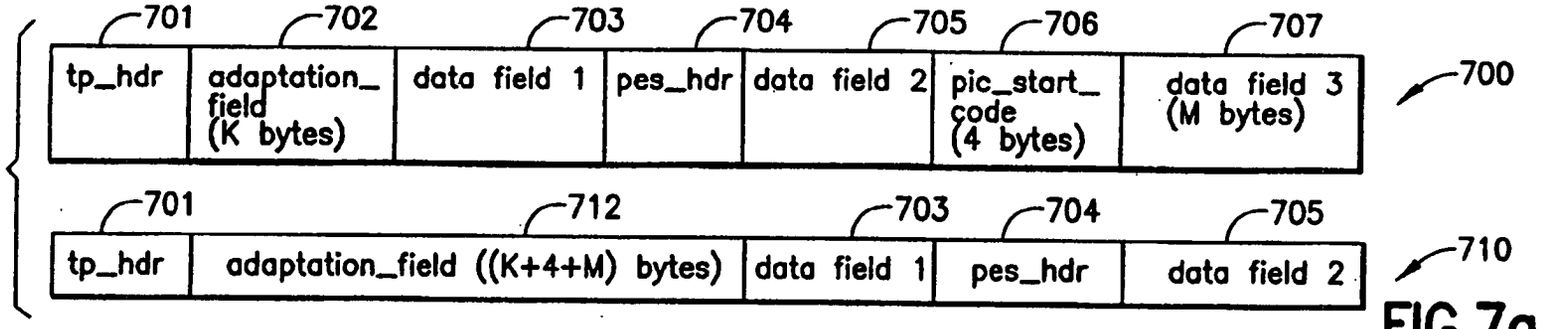

FIG.7a

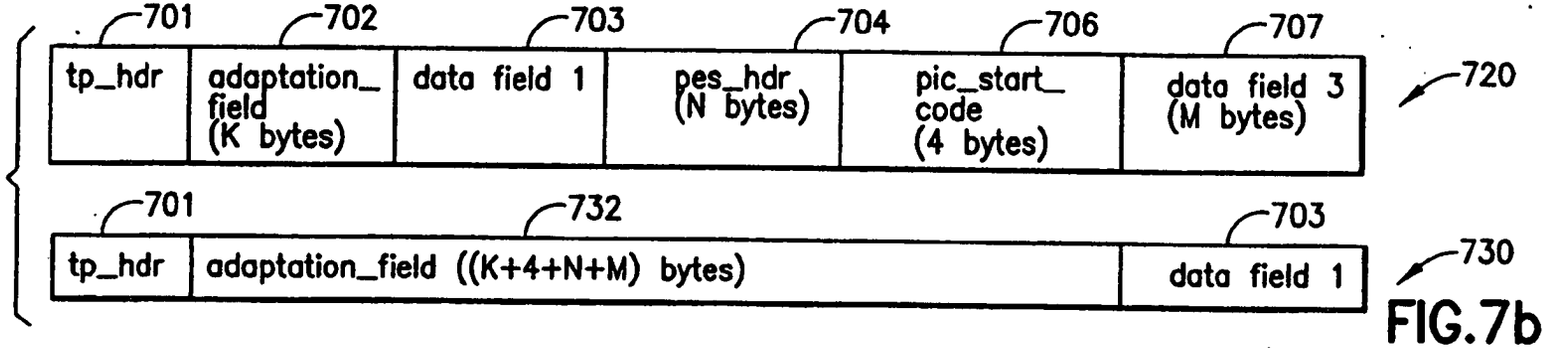

FIG.7b

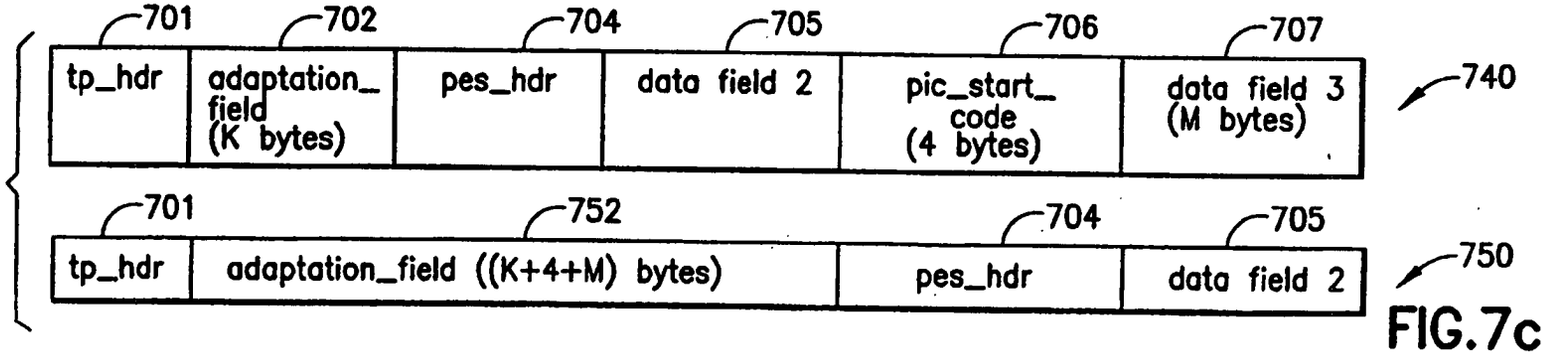

FIG.7c

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FIG.7d

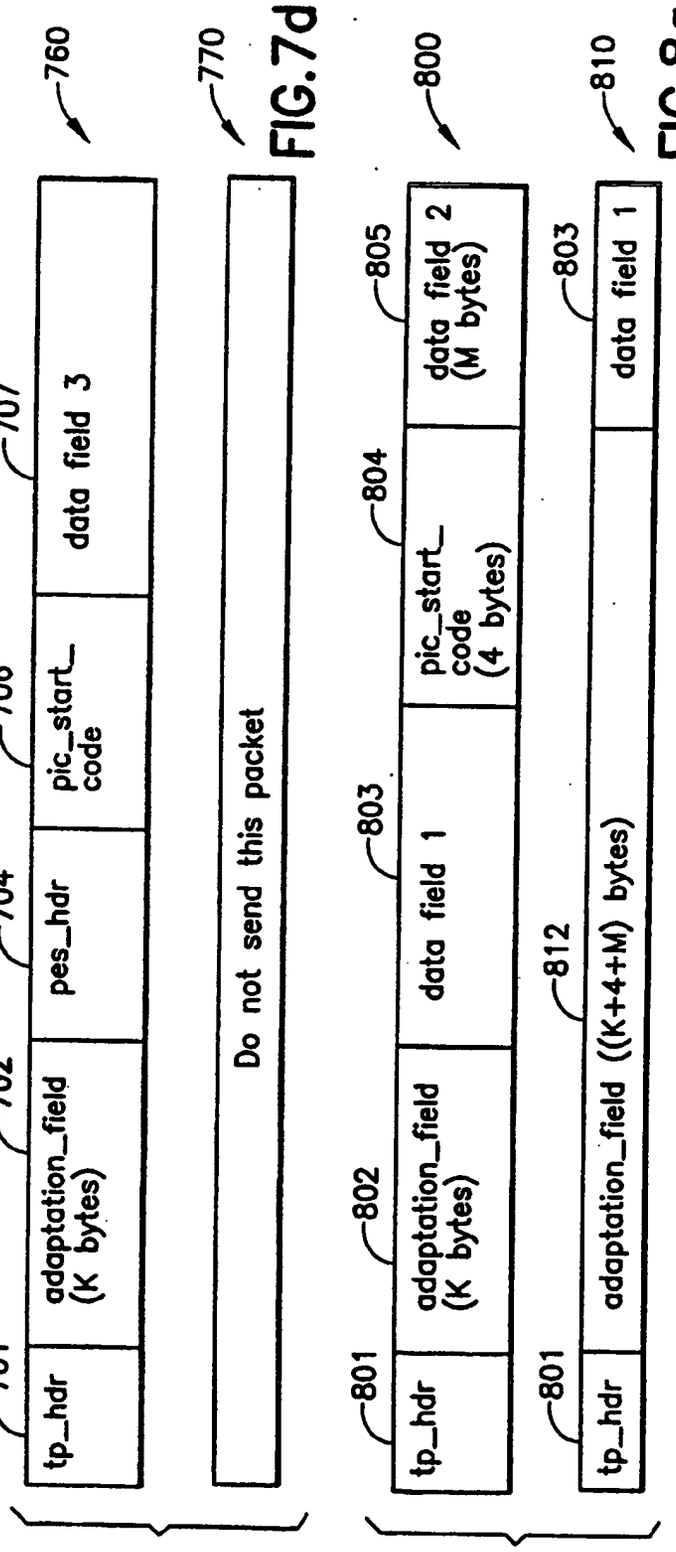

FIG.8a

FIG.8b

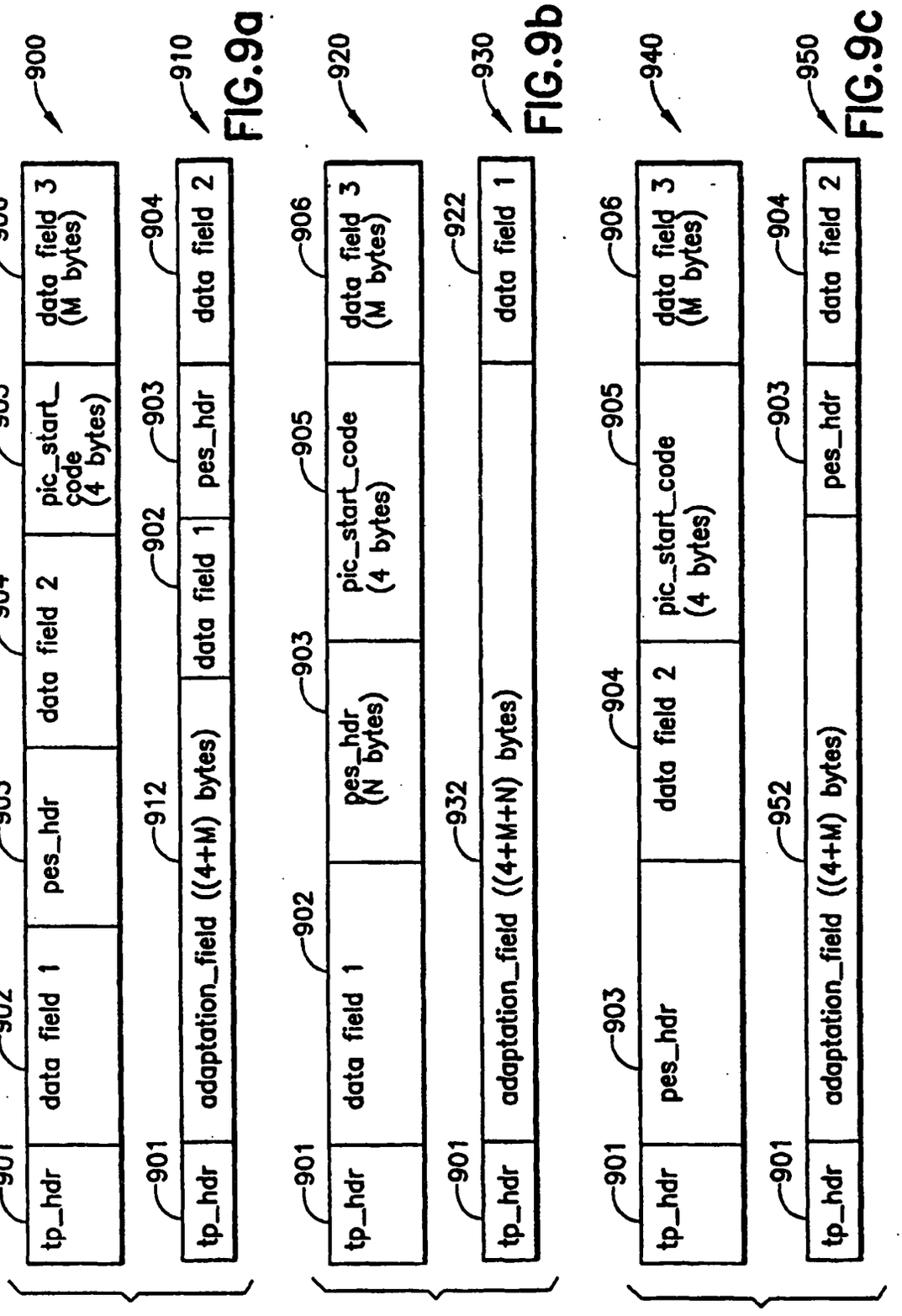

FIG.9a

FIG.9b

FIG.9c

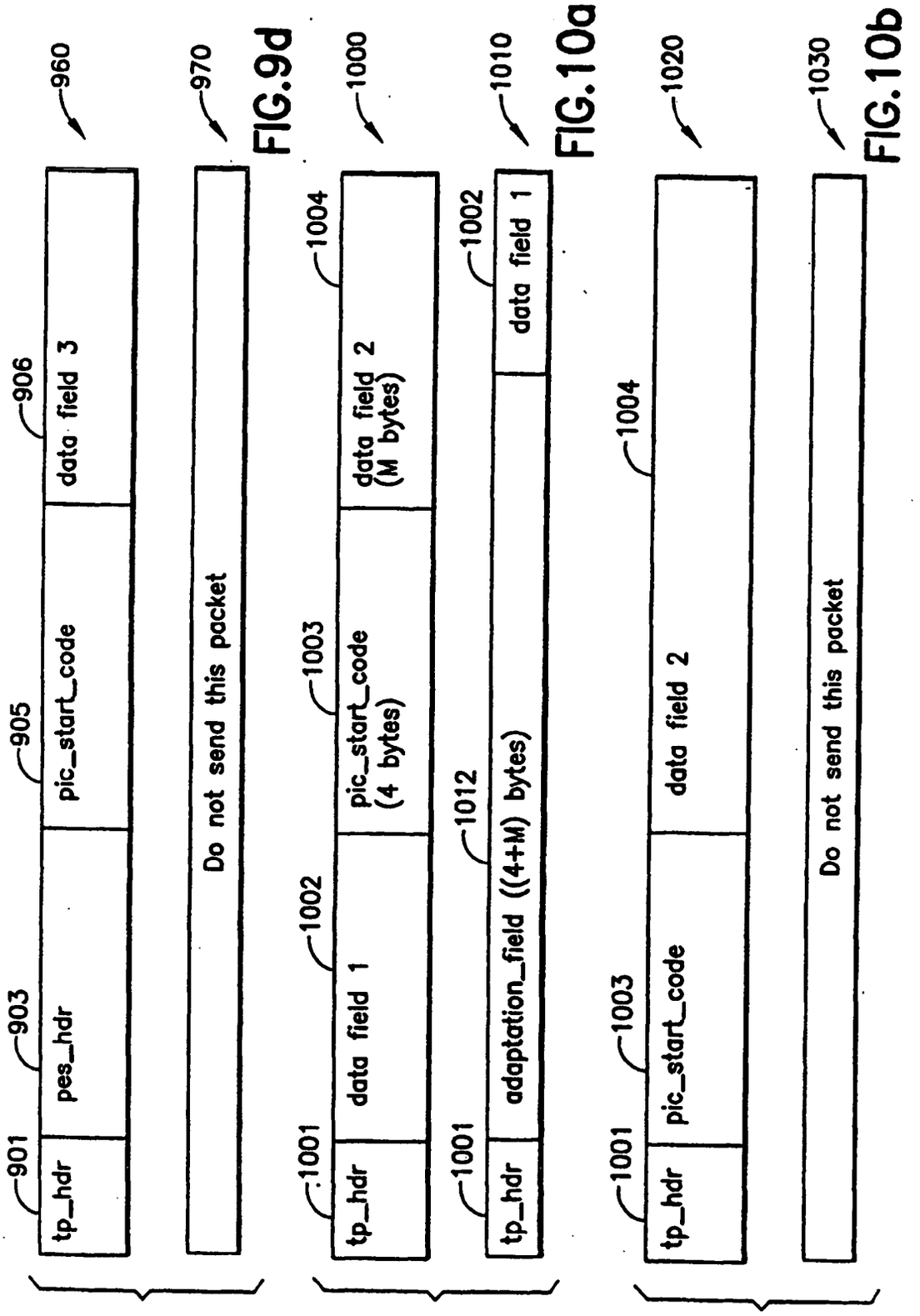

FIG.9d

FIG.10a

FIG.10b

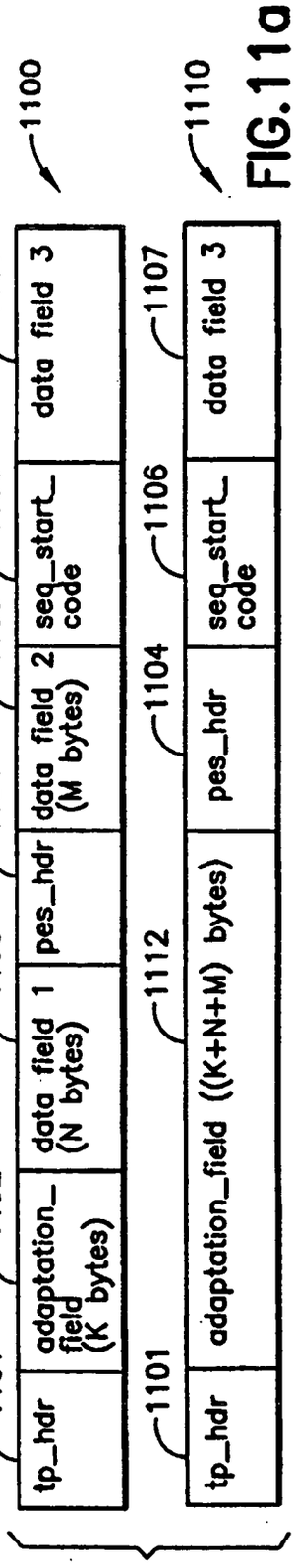

FIG.11a

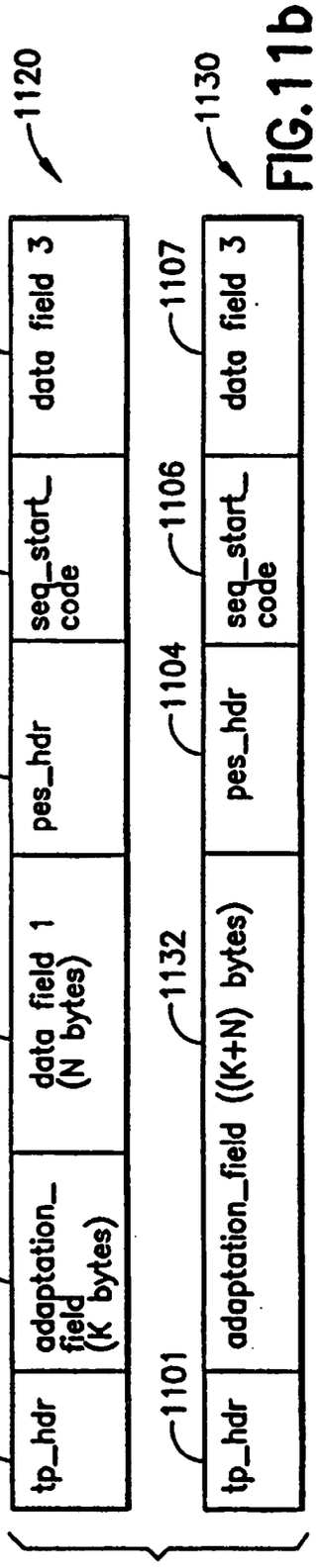

FIG.11b

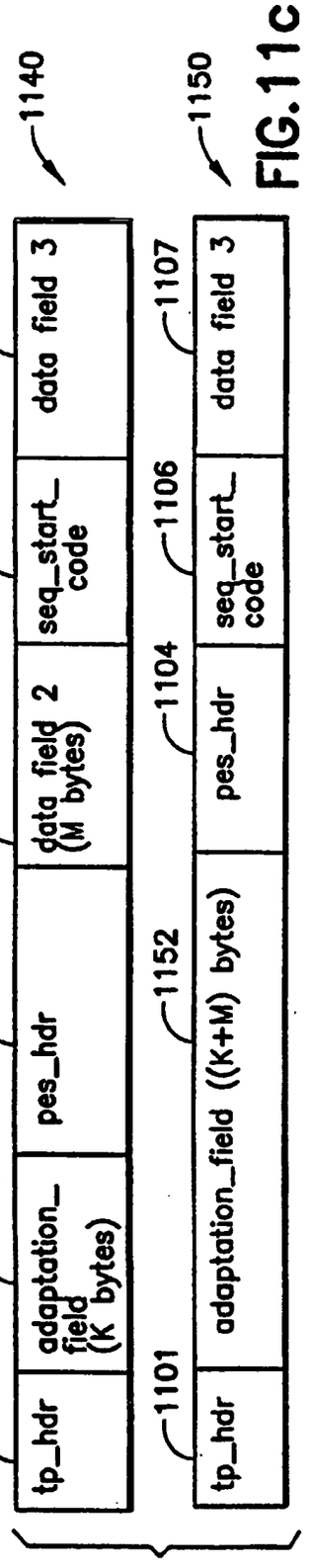

FIG.11c

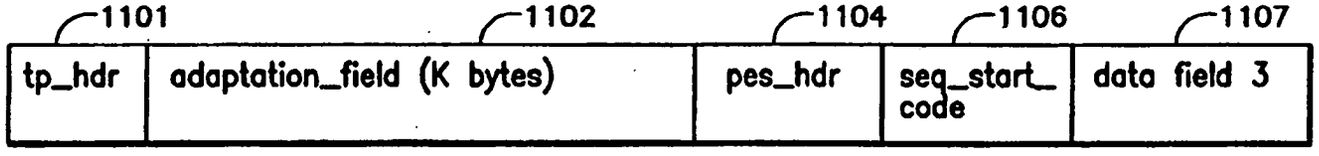

FIG.11d

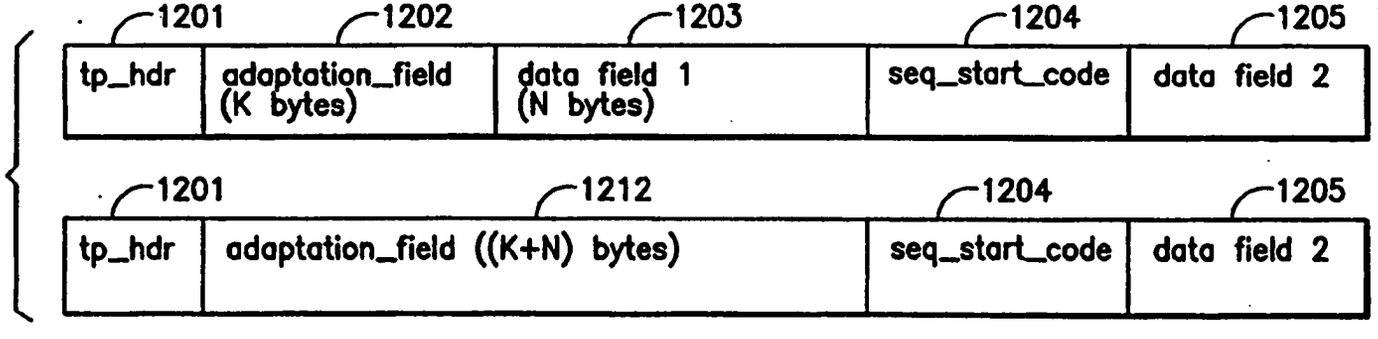

FIG.12a

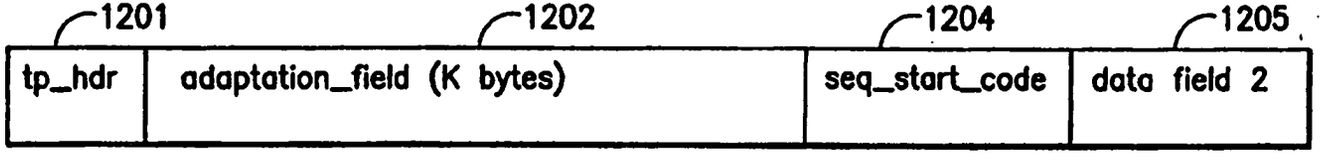

FIG.12b

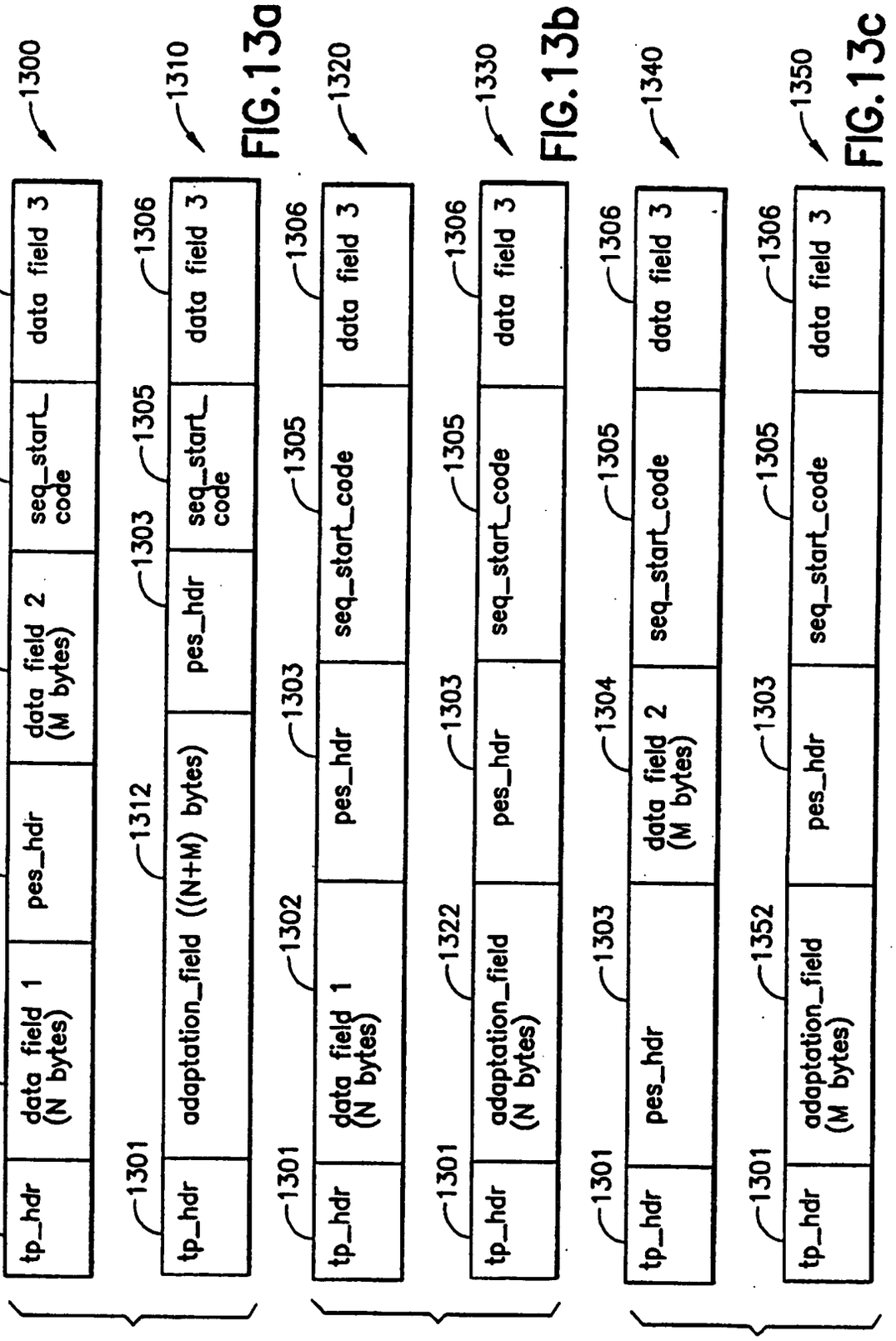

FIG.13a

FIG.13b

FIG.13c

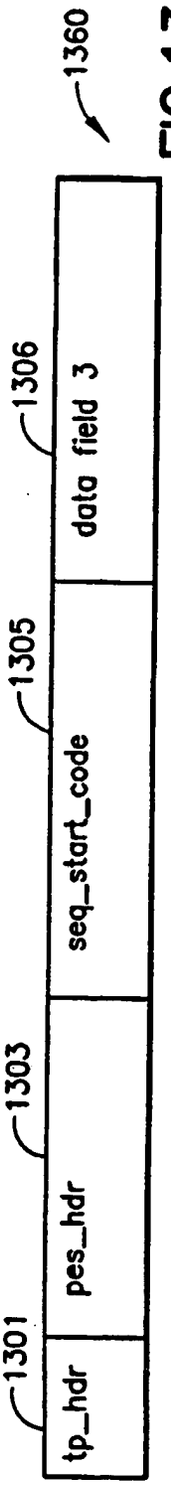

FIG.13d

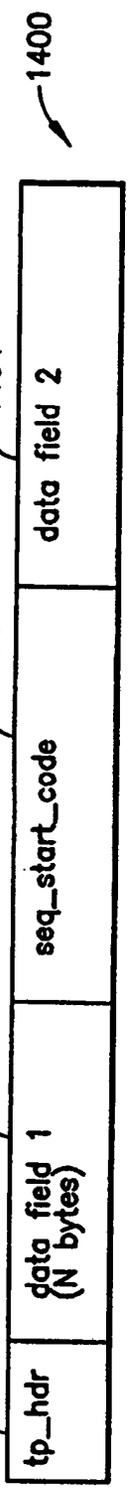

FIG.14a

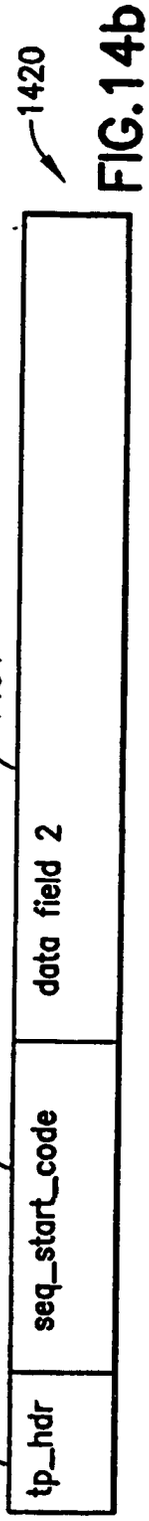

FIG.14b

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Office européen des brevets

(11) EP 0 837 609 A3

(12) EUROPEAN PATENT APPLICATION

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(51) Int Cl.7: **H04N 7/24**

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(54) Splicing compressed packetized digital video streams

(57) A secondary packetized data stream (IS), such as a commercial, is spliced with a primary packetized data stream (MS), such as a network television program. The system does not require decompression of the data in the primary data stream, and is particularly suitable for use at a cable system headend to allow the insertion of commercials from local businesses into a nationally broadcast television program. When a start signal (T_in)is received, a pre-splicing packet (700, 800, 900, 1000) of the primary stream is determined. The pre-splicing packet is the packet closest to the start time which carries an anchor frame (e.g., I or P frame) start code (706, 804, 905, 1003). To prevent a potential discontinuity at the decoder (168), the pre-splicing packet (700, 800, 900, 1000) is processed to discard the anchor frame data, and to insert a number of stuffing bytes (712, 812, 912, 1012) which is equal to the number of bytes discarded into an adaptation field of the pre-splicing packet. To further maintain continuity at the decoder, identifying data of the primary stream such as PID and PSI data, is retrieved and provided to the secondary stream. A number of null packets (430) are inserted into the output stream (OS) at the transition point between the main program and the commercial to prevent a buffer overflow at a decoder (168) which receives the output stream (OS).

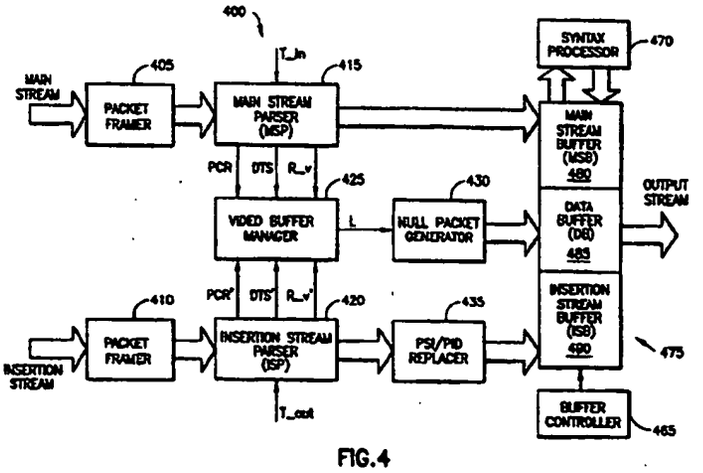

FIG.4

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 11 7818

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WEISS S M: "SWITCHING FACILITIES IN MPEG-2: NECESSARY BUT NOT SUFFICIENT" SMPTE JOURNAL,SMPTE INC. SCARSDALE, N.Y,US, vol. 104, no. 12, 1 December 1995 (1995-12-01), pages 788-802, XP000543847 ISSN: 0036-1682	1-3,5-7, 10-12, 14-16,19	H04N7/24
A	* page 790, middle column, line 25 - right-hand column, line 12 * * page 792, left-hand column, line 15 - page 798, right-hand column *	4,8,9, 13,17, 18,20	
X	"INFORMATION TECHNOLOGY - GENERIC CODING OF MOVING PICTURES AND ASSOCIATED AUDIO INFORMATION: SYSTEMS" INTERNATIONAL STANDARD, ISO/IEC 13818-1, NEW YORK, NY,US, 15 April 1996 (1996-04-15), pages I-XY,1-119, XP000667435 * page 17, paragraph 2.4.3 - page 39 * * page 104 - page 109 *	1,2,5-7, 9-11, 14-16,18	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04N
A	* page 117 - page 119 *	3,4,12, 13,19,20	
X	EP 0 692 911 A (MATSUSHITA ELECTRIC IND CO LTD) 17 January 1996 (1996-01-17)	1,3,5-7, 9,10,12, 14-16, 18,19	
A	* the whole document *	2,4,8, 11,17,20	

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	4 July 2001	Guettlich, J

CATEGORY OF CITED DOCUMENTS

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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 11 7818

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 11, 26 December 1995 (1995-12-26) & JP 07 212766 A (MATSUSHITA ELECTRIC IND CO LTD), 11 August 1995 (1995-08-11) * abstract *	1-20	
P,A	& US 5 602 592 A (MORI TOSHIAKI ET AL) 11 February 1997 (1997-02-11)	1-20	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	4 July 2001	Guettlich, J

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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 97 11 7818

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-07-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		DE 69515386 T	24-08-2000
		JP 3091393 B	25-09-2000
		JP 8084333 A	26-03-1996
		US 5534944 A	09-07-1996
JP 07212766 A	11-08-1995	US 5602592 A	11-02-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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(43) Date of A Publication 25.11.1998

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H04N 7/088 , G06F 17/30

(52) UK CL (Edition P)
G4A AUDB
H4F FBB FD22 FD24
U1S S2206

(56) Documents Cited
EP 0758833 A2 EP 0705036 A2 WO 97/46011 A1
WO 97/02702 A2 WO 94/14284 A1 US 5606691 A
US 5223924 A

(58) Field of Search
UK CL (Edition P) G4A AUDB , H4F FBB
INT CL[6] G06F 17/30 , H04N 7/088
Online: WPI

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United Kingdom

(54) Abstract Title
An electronic television programme guide

(57) An electronic programme guide (EPG) database is interrogated to produce a list of programmes that may be of interest to a viewer. Queries may be composed by users or may be developed automatically by inspection of viewing habits or viewer profiles. Viewer profiles may be produced by interrogation of the viewer. User queries may be stored hierarchically and queries relating to different viewers may be merged. Queries may be allowed to run continually to uncover programmes of interest as they arise in the EPG. Queries may restrict selection of certain categories. A 10-key alphanumeric keypad may be used to enter query data. The EPG interprets the data from each key to mean any of the numbers or letters associated therewith and identifies all possible programmes and channels and networks. As the viewer continues to add letters or numbers, the list narrows dynamically until only a few choices remain. The EPG data may be transmitted with the TV signals and may contain links to Web pages.

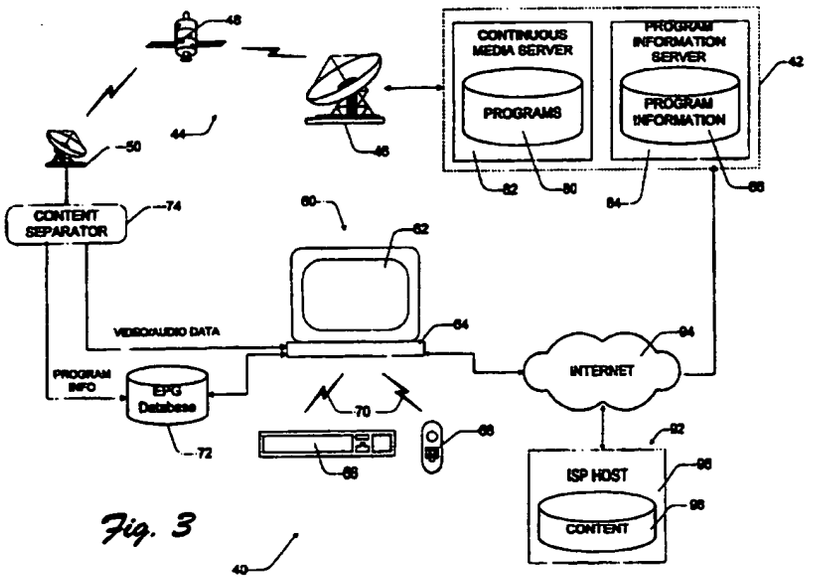

Fig. 3

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 325 537 A

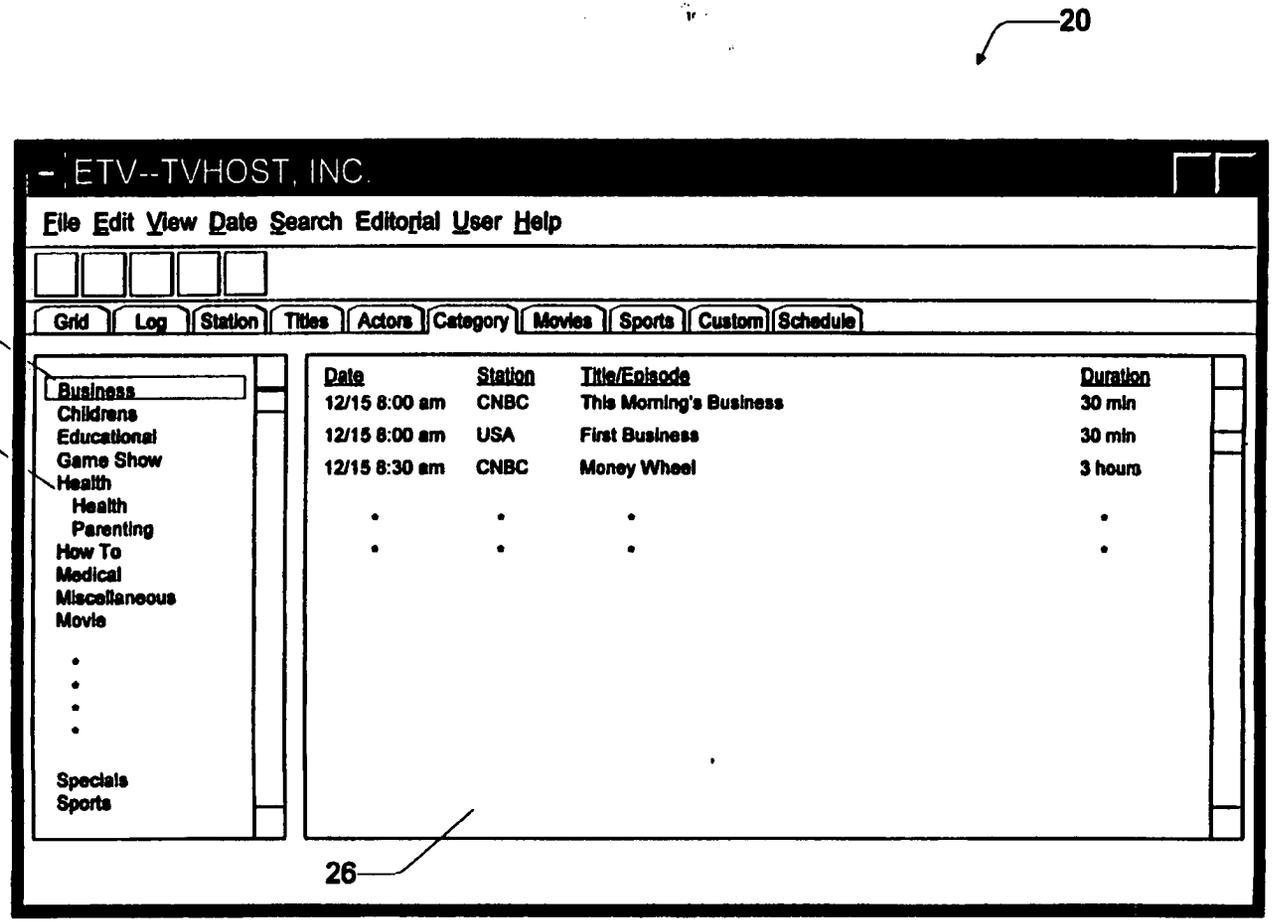

Fig. 1

Prior Art

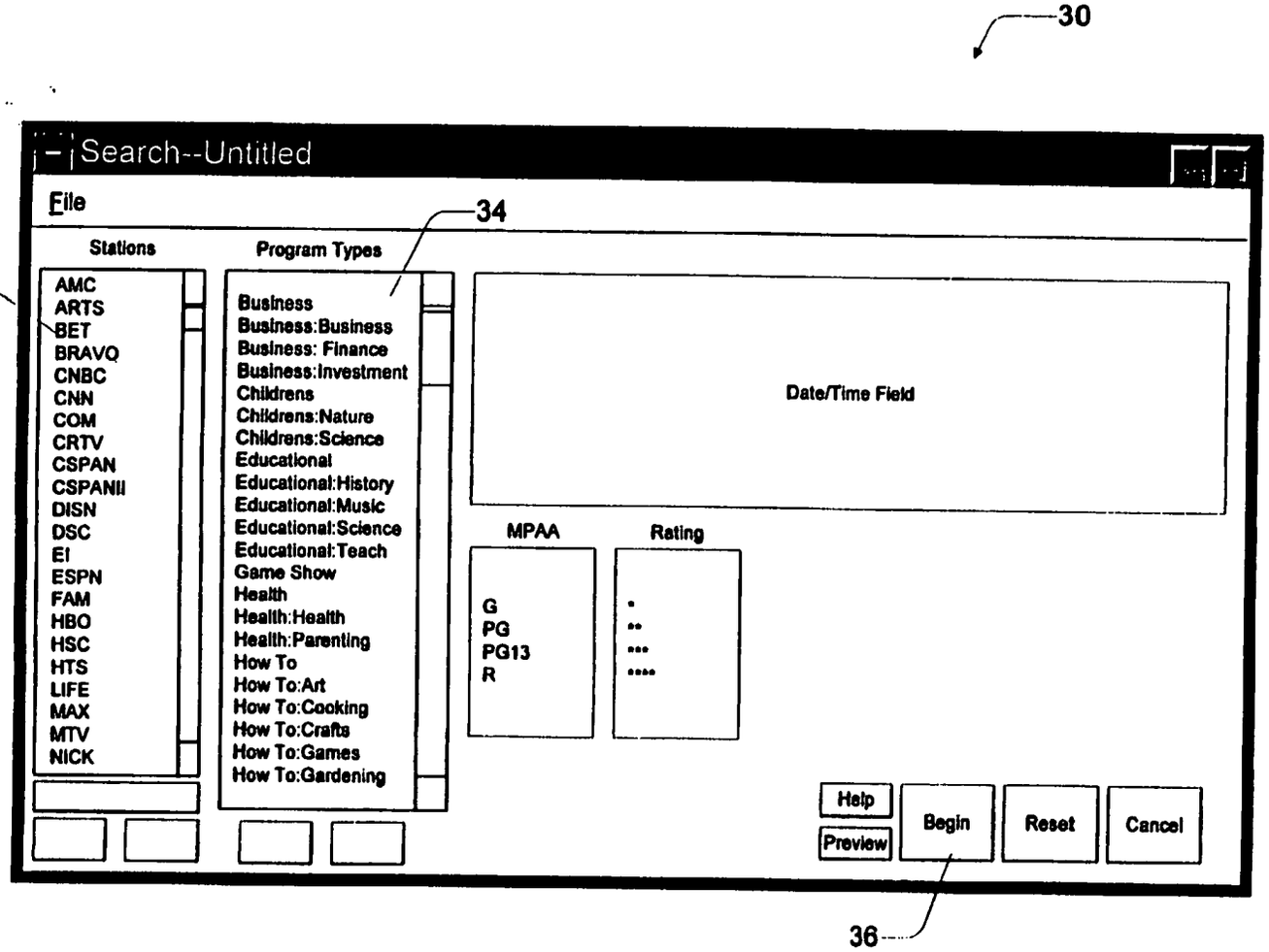

Fig. 2
Prior Art

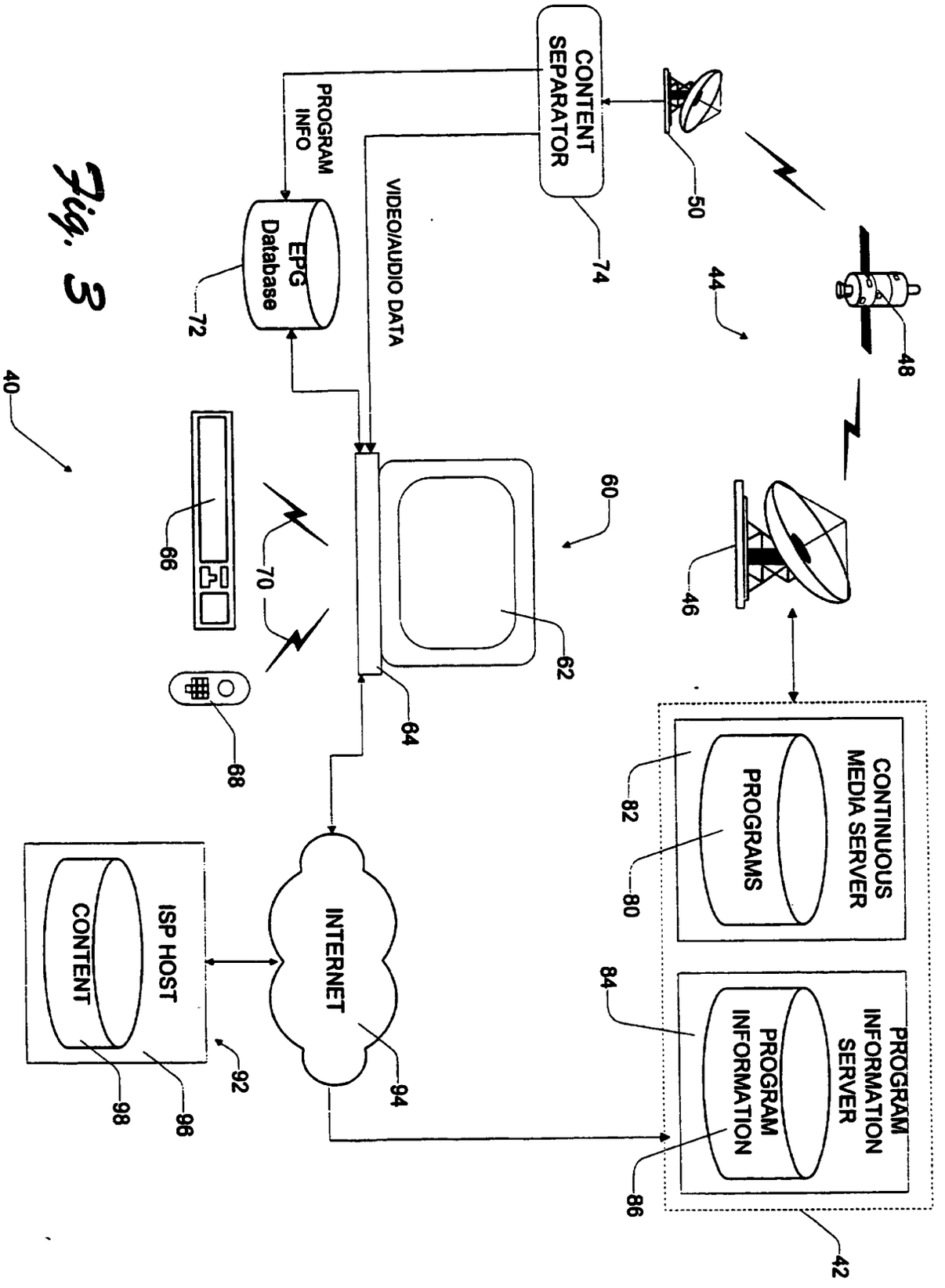
40
42
44
46
48
50
60
62
64
66
68
70
72
74
80
82
84
86
92
94
96
98
CONTENT SEPARATOR
PROGRAM INFO
VIDEO/AUDIO DATA
EPG Database
CONTINUOUS MEDIA SERVER
PROGRAMS
PROGRAM INFORMATION SERVER
PROGRAM INFORMATION
INTERNET
ISP HOST
CONTENT

Fig. 3

88

STORAGE POINTER	TITLE	ACTOR	CC	STEREO	TIME	NETWORK	SUPPLEMENTAL CONTENT	DESCRIPTION
PROG1	MURDER, SHE WROTE	LANDSBURY	YES	YES	8:00 PM THURSDAY	CBS	CONTENT1	"The Secret of Gila Junction" Jessica...
PROG2	SEINFELD	SEINFELD	YES	YES	9:00 PM THURSDAY	NBC	http://www.nbc.com/seinfeld.html	"The Friars Club" Jerry tries...
PROG3	STAR TREK NEXT GEN.	STEWART	YES	YES	10:00 PM FRIDAY	FOX	http://www.fox.com/startrek.html http://www.collections.com/trekiecollectables.html	"Delta Vega" Picard is faced....

90

Fig. 4

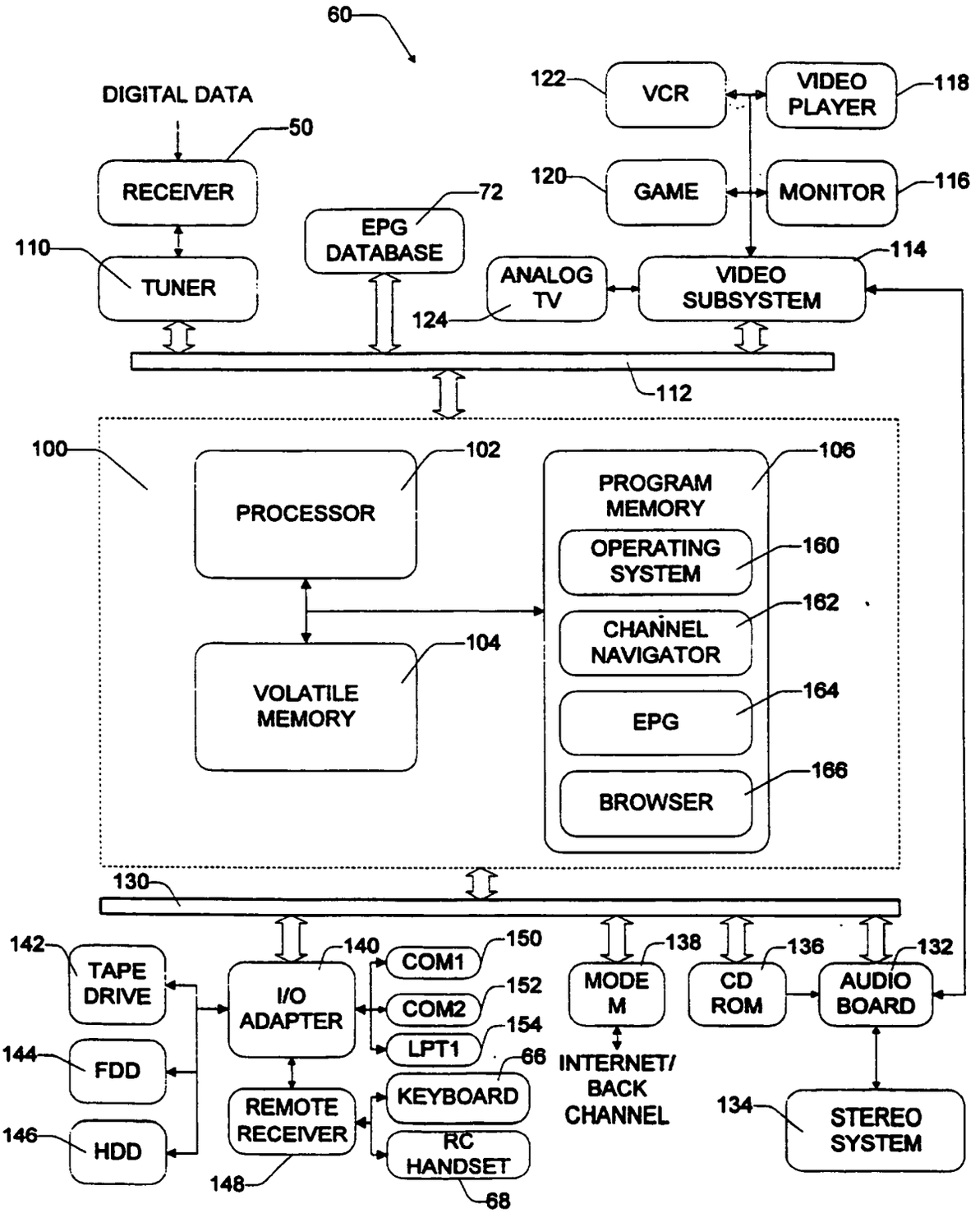
60
DIGITAL DATA
50
RECEIVER
110
TUNER
72
EPG DATABASE
122
VCR
VIDEO PLAYER
118
120
GAME
MONITOR
116
ANALOG TV
124
VIDEO SUBSYSTEM
114
112
100
PROCESSOR
102
PROGRAM MEMORY
106
OPERATING SYSTEM
160
CHANNEL NAVIGATOR
162
VOLATILE MEMORY
104
EPG
164
BROWSER
166
130
142
TAPE DRIVE
144
FDD
146
HDD
I/O ADAPTER
140
COM1
150
COM2
152
LPT1
154
REMOTE RECEIVER
148
KEYBOARD
66
RC HANDSET
68
MODEM
138
INTERNET/ BACK CHANNEL
CD ROM
136
AUDIO BOARD
132
134
STEREO SYSTEM

Fig. 5

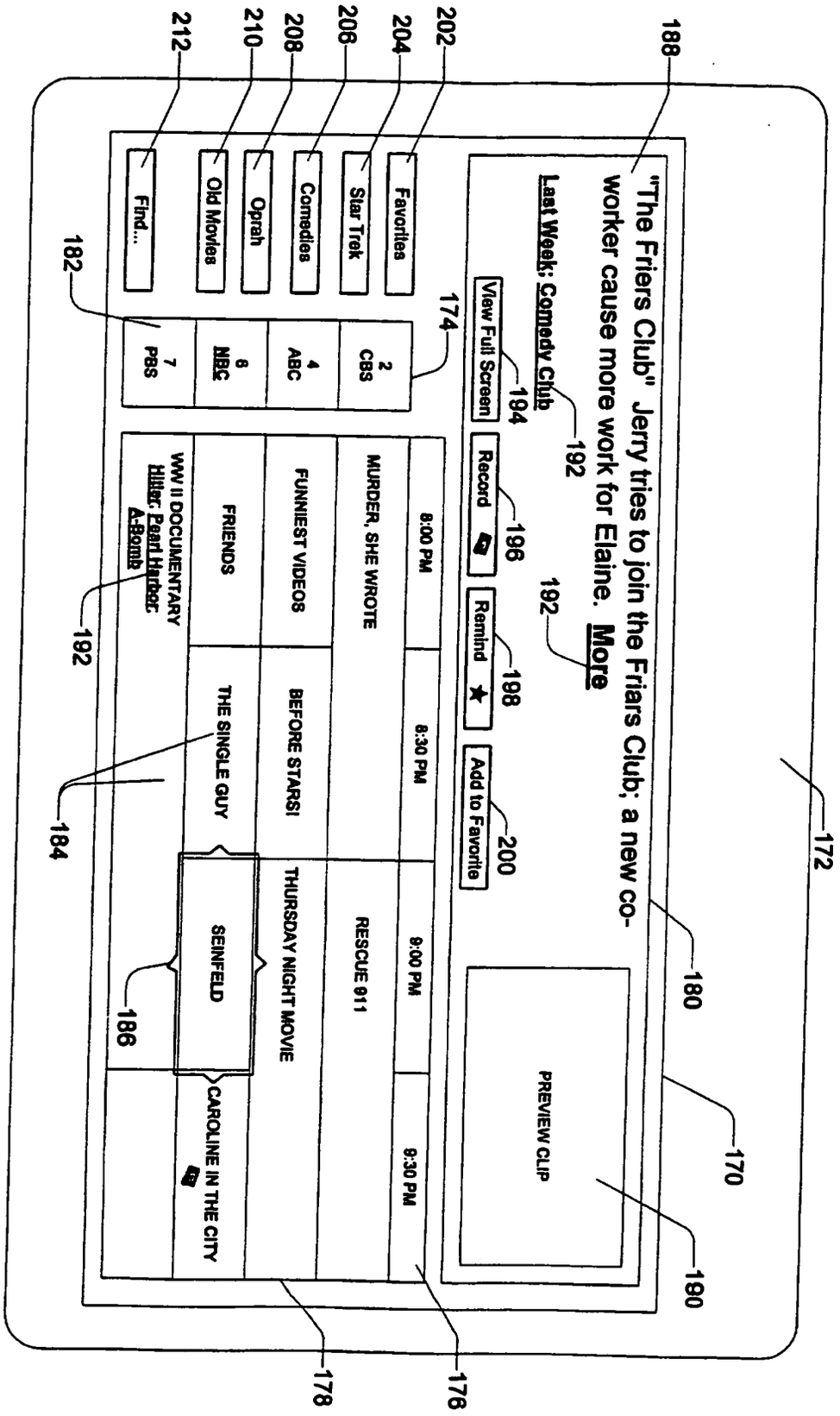
"The Friers Club" Jerry tries to join the Friars Club; a new co-worker cause more work for Elaine. More
Last Week: Comedy Club
View Full Screen
Record
Remind
Add to Favorite
PREVIEW CLIP
Favorites
Star Trek
Comedies
Oprah
Old Movies
Find...
2 CBS
4 ABC
6 NBC
7 PBS
8:00 PM
8:30 PM
9:00 PM
9:30 PM
MURDER, SHE WROTE
FUNNIEST VIDEOS
FRIENDS
WW II DOCUMENTARY Hitler: Pearl Harbor: A-Bomb
BEFORE STARS!
THE SINGLE GUY
RESCUE 911
THURSDAY NIGHT MOVIE
SEINFELD
CAROLINE IN THE CITY
172
174
176
178
180
182
184
186
188
190
192
194
196
198
200
202
204
206
208
210
212

Fig. 6

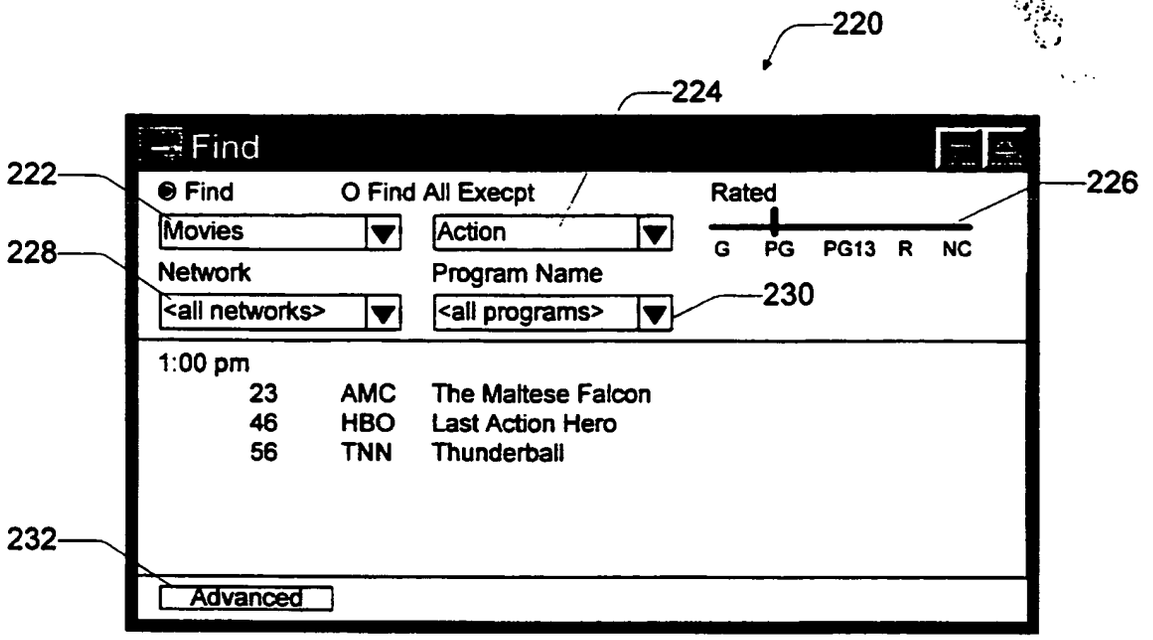
220
224
Find
222
Find
O Find All Execpt
Rated
226
Movies
Action
228
G PG PG13 R NC
Network
Program Name
<all networks>
<all programs>
230
1:00 pm
23 AMC The Maltese Falcon
46 HBO Last Action Hero
56 TNN Thunderball
232
Advanced

Fig. 7

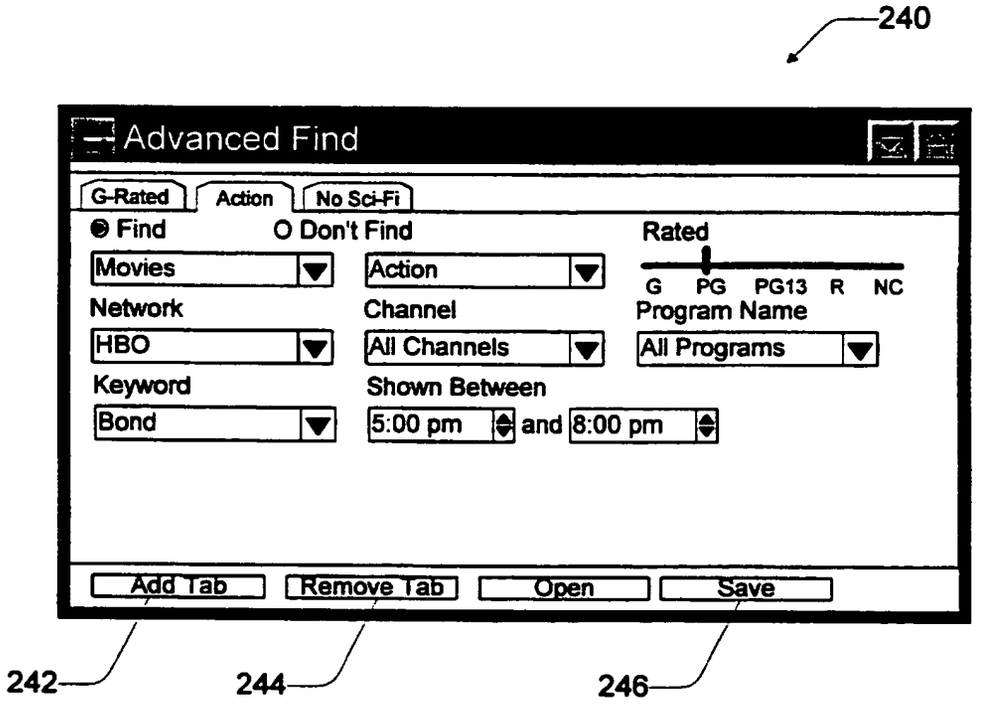
240
Advanced Find
G-Rated
Action
No Sci-Fi
Find
O Don't Find
Rated
Movies
Action
G PG PG13 R NC
Network
Channel
Program Name
HBO
All Channels
All Programs
Keyword
Shown Between
Bond
5:00 pm
and
8:00 pm
Add Tab
Remove Tab
Open
Save
242
244
246

Fig. 8

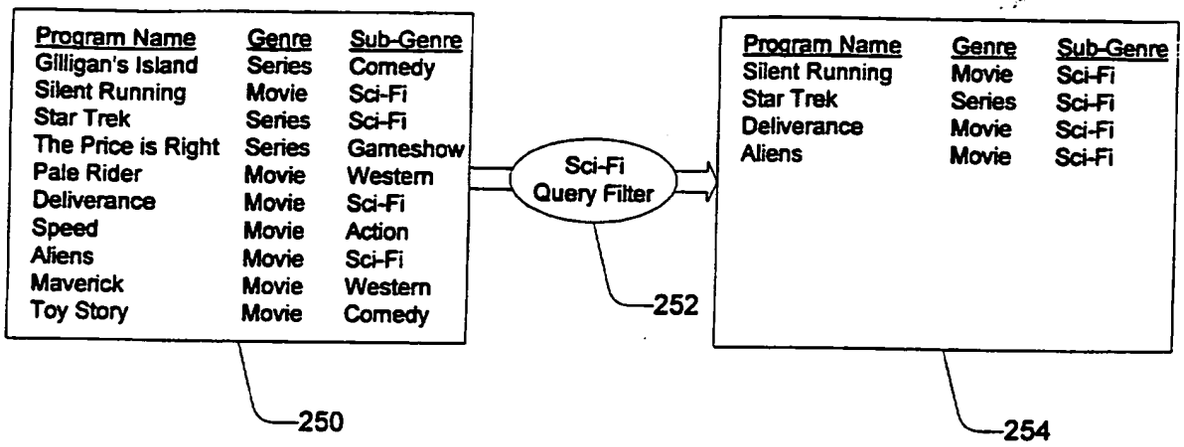
Program Name | Genre | Sub-Genre
Gilligan's Island | Series | Comedy
Silent Running | Movie | Sci-Fi
Star Trek | Series | Sci-Fi
The Price is Right | Series | Gameshow
Pale Rider | Movie | Western
Deliverance | Movie | Sci-Fi
Speed | Movie | Action
Aliens | Movie | Sci-Fi
Maverick | Movie | Western
Toy Story | Movie | Comedy
250
Sci-Fi Query Filter
252
Program Name | Genre | Sub-Genre
Silent Running | Movie | Sci-Fi
Star Trek | Series | Sci-Fi
Deliverance | Movie | Sci-Fi
Aliens | Movie | Sci-Fi
254

Fig. 9

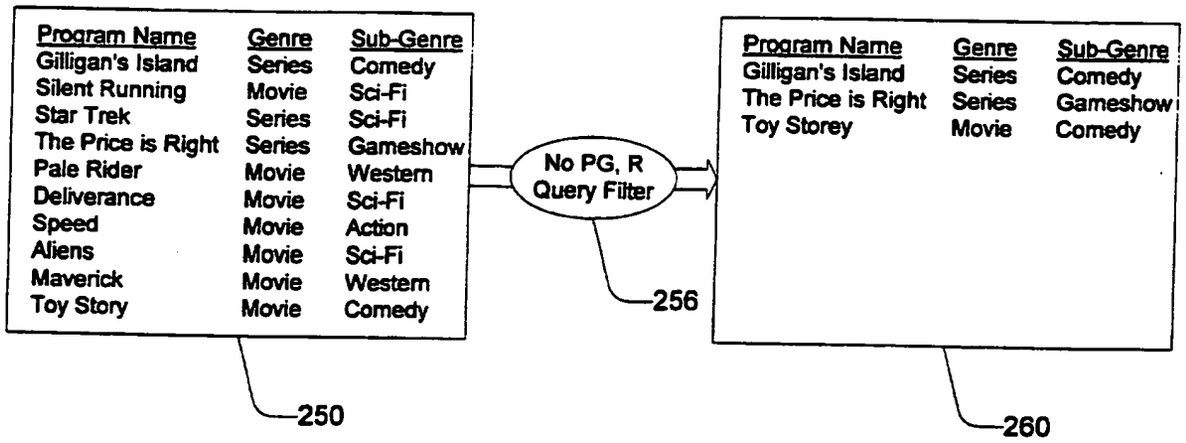
Program Name | Genre | Sub-Genre
Gilligan's Island | Series | Comedy
Silent Running | Movie | Sci-Fi
Star Trek | Series | Sci-Fi
The Price is Right | Series | Gameshow
Pale Rider | Movie | Western
Deliverance | Movie | Sci-Fi
Speed | Movie | Action
Aliens | Movie | Sci-Fi
Maverick | Movie | Western
Toy Story | Movie | Comedy
250
No PG, R Query Filter
256
Program Name | Genre | Sub-Genre
Gilligan's Island | Series | Comedy
The Price is Right | Series | Gameshow
Toy Storey | Movie | Comedy
260

Fig. 10

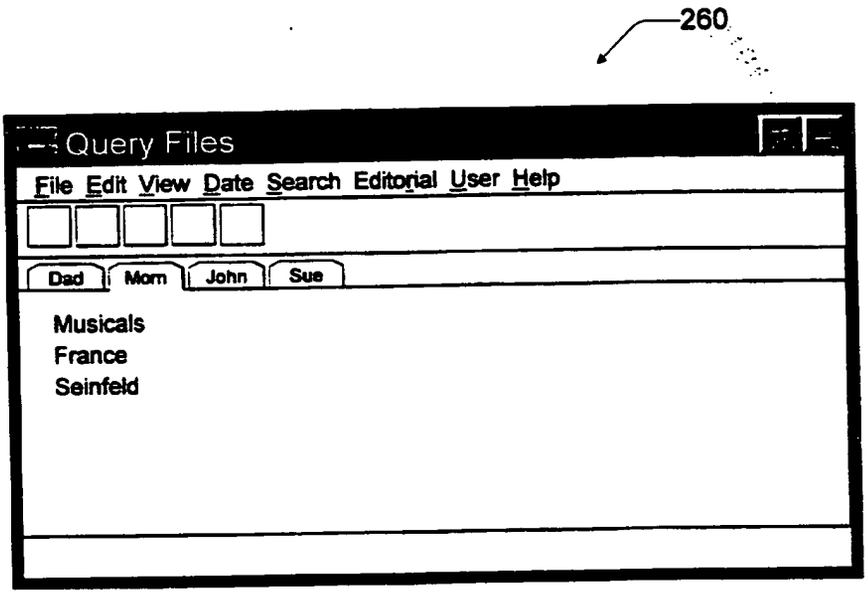
260
Query Files
File Edit View Date Search Editorial User Help
Dad
Mom
John
Sue
Musicals
France
Seinfeld

Fig. 11

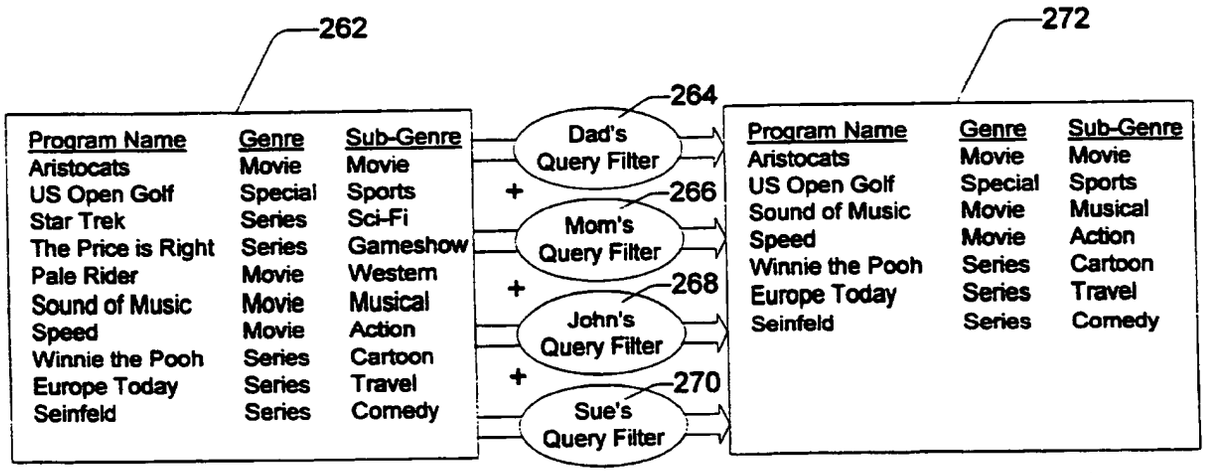
262
264
266
268
270
272
Program Name
Genre
Sub-Genre
Aristocats Movie Movie
US Open Golf Special Sports
Star Trek Series Sci-Fi
The Price is Right Series Gameshow
Pale Rider Movie Western
Sound of Music Movie Musical
Speed Movie Action
Winnie the Pooh Series Cartoon
Europe Today Series Travel
Seinfeld Series Comedy
Dad's Query Filter
Mom's Query Filter
John's Query Filter
Sue's Query Filter
+
+
+
Program Name
Genre
Sub-Genre
Aristocats Movie Movie
US Open Golf Special Sports
Sound of Music Movie Musical
Speed Movie Action
Winnie the Pooh Series Cartoon
Europe Today Series Travel
Seinfeld Series Comedy

Fig. 12

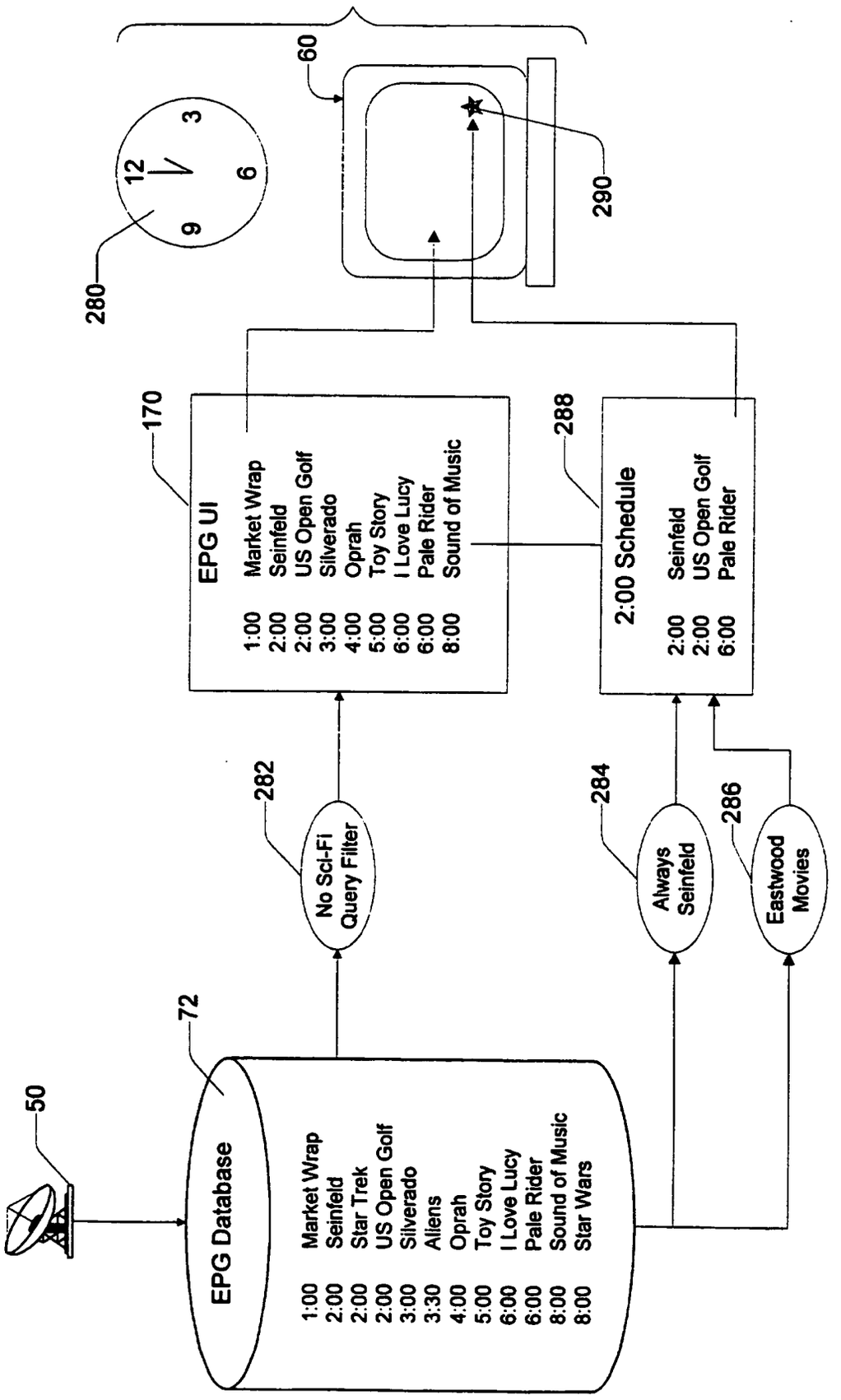
50
72
EPG Database
1:00 Market Wrap
2:00 Seinfeld
2:00 Star Trek
2:00 US Open Golf
3:00 Silverado
3:30 Aliens
4:00 Oprah
5:00 Toy Story
6:00 I Love Lucy
6:00 Pale Rider
8:00 Sound of Music
8:00 Star Wars
282
No Sci-Fi Query Filter
284
Always Seinfeld
286
Eastwood Movies
170
EPG UI
1:00 Market Wrap
2:00 Seinfeld
2:00 US Open Golf
3:00 Silverado
4:00 Oprah
5:00 Toy Story
6:00 I Love Lucy
6:00 Pale Rider
8:00 Sound of Music
288
2:00 Schedule
2:00 Seinfeld
2:00 US Open Golf
6:00 Pale Rider
280
12
3
6
9
60
290

Fig. 13

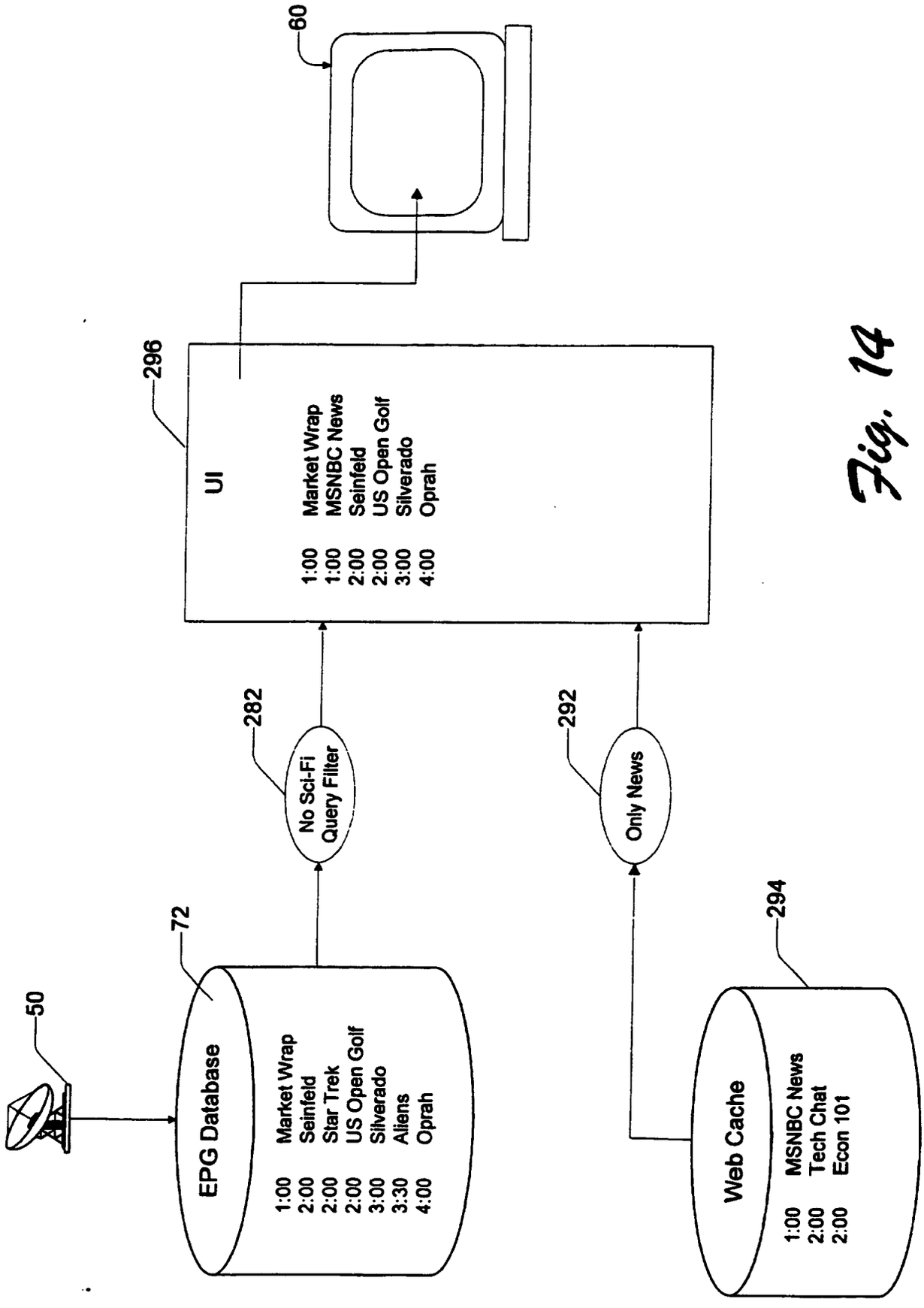
60
296
UI
1:00 Market Wrap
1:00 MSNBC News
2:00 Seinfeld
2:00 US Open Golf
3:00 Silverado
4:00 Oprah
282
No Sci-Fi Query Filter
292
Only News
50
72
EPG Database
1:00 Market Wrap
2:00 Seinfeld
2:00 Star Trek
2:00 US Open Golf
3:00 Silverado
3:30 Aliens
4:00 Oprah
294
Web Cache
1:00 MSNBC News
2:00 Tech Chat
2:00 Econ 101

Fig. 14

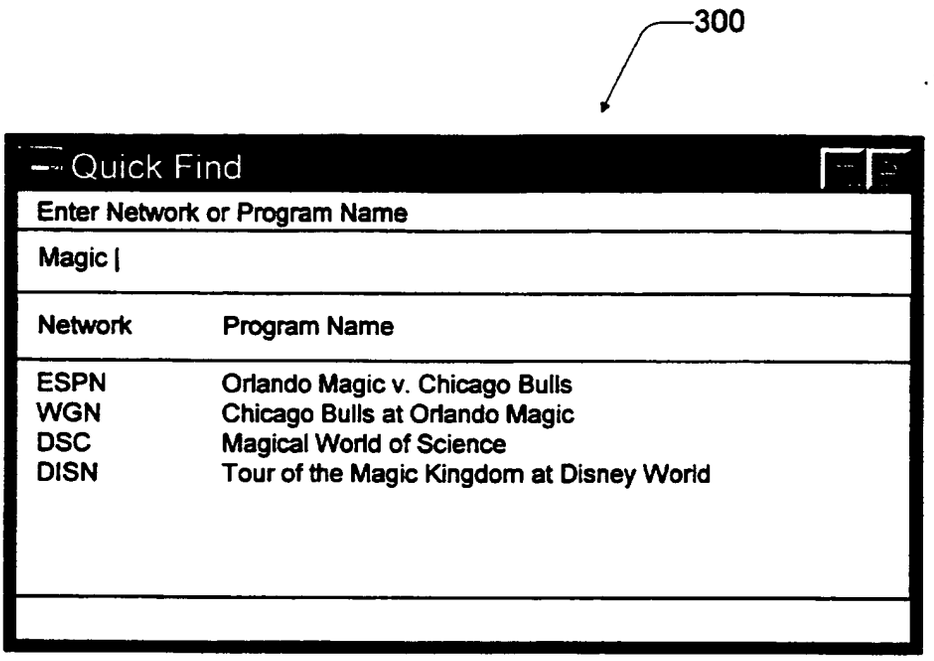
300
Quick Find
Enter Network or Program Name
Magic |
Network
Program Name
ESPN
Orlando Magic v. Chicago Bulls
WGN
Chicago Bulls at Orlando Magic
DSC
Magical World of Science
DISN
Tour of the Magic Kingdom at Disney World

Fig. 15

QUERY-BASED ELECTRONIC PROGRAM GUIDE

TECHNICAL FIELD

This invention relates to entertainment systems, such as interactive television or interactive computing network systems, and to electronic program guides which operate in conjunction with these systems. More particularly, this invention relates to methods for operating electronic program guides using auto-generated and viewer-generated queries to identify programs or other programming information.

BACKGROUND OF THE INVENTION

Television viewers are very familiar with printed programming schedules that appear in daily newspapers or weekly magazines, such as TV Guide®. The printed program guide lists the various television shows in relation to their scheduled viewing time on a day-to-day basis.

Cable TV systems often include a channel with a video broadcast of the printed program guide. The cable channel is dedicated to displaying listings of programs available on the different available channels. The listings are commonly arranged in a grid. Each column of the grid represents a particular time slot, such as 4:00 p.m. to 4:30 p.m. Each row represents a particular broadcast or cable channel, such as ABC, PBS, or ESPN. The various scheduled programs or shows are arranged within the rows and columns, indicating the channels and times at which they can be found. The grid is continuously scrolled vertically so that a viewer watches a continuously refreshing set of programs within three or four time slots.

Data for available programs is typically received by a cable system as a plurality of data records. Each available program has a single corresponding data

record indicating a variety of information about the program such as its channel, its starting and ending times, its title, names of starring actors, whether closed-captioning and stereo are available, and perhaps a brief description of the program. It is not difficult to format a grid such as described above from this type of data records. The grid is typically formatted once at the cable system's headend and broadcast repeatedly and continuously to the thousands of homes served by the cable system.

Newer, interactive cable distribution systems feature electronic program guides (EPGs) which function somewhat similar to the broadcast program listing channels described above. Rather than scrolling automatically, however, an EPG allows a viewer to use a remote control device or other input device to scroll as desired both horizontally and vertically through a program grid. This functionality utilizes the two-way communications capabilities of interactive cable systems.

The EPG is typically implemented in software which runs on a set-top box (STB) connected between a TV and a cable system home entry line. When scrolling to a new column or row, the set-top box inserts the appropriate programming information into each new row or column. This information is either cached at the STB, or requested from the cable system's headend.

Interactive systems permit viewers to control what programs are shown on their TV and when. Movies-on-demand is one example of this interactive control. A viewer can peruse a list of available movies from the EPG, and then order a selected movie. The STB sends a request for the movie to the headend server. The movie is retrieved and transmitted to the requesting STB. Movies-on-demand thus enables viewers to shop, purchase, and watch a movie at their convenience, as

opposed to being restricted to certain start times as is typical with conventional premium or pay-per-view channels.

Many industry and commercial experts expect entertainment systems to evolve to the point of offering many other interactive services to the consumers. For instance, consumers will be able to use their TV or computer to shop for groceries or other goods, conduct banking and other financial transactions, play games, or attend educational courses and take exams.

Conventional distribution networks support many channels. It is common for a TV audience to have 50 to 100 channels. However, as technology improves and programming content continues to expand, the number of channels are expected to increase dramatically to many hundreds, or even thousands of channels.

One problem with the growth in the number of channels is that vastly enlarged selection, while appealing to a viewer, will make it more difficult for a viewer to locate programs of their preference. Traditional methods of locating programs—such as memorizing channel numbers, scanning program grids, or random surfing—will become less effective as the number of channels increase. For example, imagine the difficulty in trying to present hundreds or thousands of programs in a scrollable grid-like EPG user interface (UI), which might show only a few programs or channels at one time. This UI structure will most likely be unworkable for large program and channel offerings. Additionally, surfing through hundreds or thousands of channels will likely consume a large amount of time, causing the viewer to miss the programs he/she is attempting to find.

It is also likely that the traditional practice of relating programs and networks to specific channels will become less meaningful as the number of

channels increases. Suppose, for example, a viewer might be interested in watching football. Today, a viewer might remember that channel 6 (NBC) and channel 3 (FOX) carry the football games and simply tune to one of these channels. In the future, however, there might be football games being broadcast on channels 78, 495, and 1042. These channels might be small local stations that are broadcasting their local football team, or one of many channels used by a major network. Viewers are not likely to remember that channels 78, 495, and 1042 are carrying football games at specific times.

Moreover, the correlation of channels to networks and programs vary from market to market. For instance, the sports network ESPN might be carried on channel 15 in one market and on channel 29 in another market. Memorizing program offerings in terms of channel numbers will prove frustrating as a viewer travels from one market to the next.

Accordingly, there is a need to develop operating methods which allow viewers to easily find programs or networks regardless of the channels on which they are carried. Additionally, these operating methods should enable viewers to locate programs regardless of whether they remember the channel number, program name, or network name.

Toward this end, a company named TVHost, Inc. has developed a software-based product "ETV" which assists a viewer in locating particular programs. The ETV system organizes the different program offerings according to different topical categorizes. Fig. 1 shows an example screen display of a graphical user interface (UI) window 20 supported by the ETV system. The ETV window 20 has a first pane 22 that lists alphabetically predefined types of programs, such as Business, Children, Educational, Game Shows, and so forth. The viewer can

control a focus frame or highlight bar 24 to choose a type of program from the first pane 22. A second pane 26 contains a list of programs that are available for the program type highlighted in the first pane 22. In this example, the type "business" is highlighted, and hence business-related programs are shown in the second pane 26. The second pane 26 also provides other programming information including start time, network or station, and duration.

The ETV system thereby offers an alternative to a scrollable grid presentation which organizes programs according to type. This allows the viewer to select a program type, and then review the programs offered for this type. The ETV system also permits rudimentary "search" capabilities. Fig. 2 shows another graphical UI window 30 which appears when performing a search. A first pane 32 contains a scrollable alphabetized list of stations, and allows a viewer to choose a station. A second pane 34 contains a scrollable alphabetized list of program types from which the viewer may select a program type. Other parameters, such as MPAA, rating, and start time, can also be selected by the viewer. Based upon these selections, the ETV system locates programs which are of a particular type, from the selected station, and satisfy the ratings and start times.

The ETV system is limited in many respects. The ETV system does not permit searches on arbitrary fields. Instead, the categories are predefined for the viewer. The viewer is not able to define his/her own complex searches using, for example, Boolean logic of "OR," "AND," and "NOT." Another limitation is that the ETV system does not provide any active controls which intelligently narrows selections based upon viewer selections. An "active" control is a control that does not require any other action on the part of the user. For instance, if a viewer selects a station in pane 32 of the search window 30 (Fig. 2), all program types will

be listed in the second pane 34. In fact, the same lists will always occur in both the first and second panes 32, 34 regardless of what selections the viewer has previously made. The viewer is not able to see any results until the viewer activates a "Begin" search key 36.

Accordingly, there remains a need to develop operating methods which decouple associations between the channel and network or program and also allow intelligent search procedures to better assist the viewer in locating preferred programs.

SUMMARY OF THE INVENTION

This invention concerns an electronic program guide (EPG) which enables creation of queries to facilitate simple and complex searches across predefined and arbitrary fields. The EPG organizes and presents programming information to a viewer. The EPG is implemented in software which executes on a processor resident in a viewer computing unit. As described herein, the viewer computing unit can be implemented as a set-top box (STB) connected to a television (TV), as a computer and monitor, or the like.

According to one aspect of this invention, the EPG is configured to automatically identify programs that a viewer is likely to prefer. The EPG collects viewing preferences of a viewer by, for example, monitoring and logging viewing habits of the viewer or through creation of a viewer profile in which a viewer answers a series of questions designed to discover the viewer's likes and dislikes. Based upon the these viewer preferences, the EPG automatically develops queries for identifying programs that the viewer is likely to watch and presents those programs to the viewer.

The EPG can further be configured to merge the queries of individual viewers into a composite query which searches for programs on behalf of all viewers. Each viewer defines his/her own query. For instance, one family member might define a query for college basketball games, another family member might define a query for Civil War programs, and another family member might define a query for cartoons. The EPG then creates a unified query which combines the three queries to jointly identify programs which satisfy any one of the three queries.

The EPG saves queries in a hierarchic structure to make it easy for a viewer to organize and retrieve queries. The viewer can define directories and sub-directories to organize the queries. For instance, a viewer might arrange queries for different kinds of movies within a Movie directory and queries for sports within a Sports directory. Another example organization is to arrange queries within separate user directories.

According to another aspect, the EPG is configured to run queries in background so that the queries are periodically executed unbeknownst to the viewer. When the EPG identifies a particular program satisfying the background query, the EPG automatically notifies the viewer of the program and/or automatically initiates procedures to record the program. For example, suppose a viewer wants to watch shows on the Great Wall of China. The viewer can define a query for identify any programs mentioning the Great Wall and have the query execute in background, perhaps for a long duration of time. As the EPG identifies programs on the Great Wall, the EPG notifies the viewer of when the program is scheduled to be shown, and to initiate recording procedures.

According to another aspect of this invention, the EPG assists a viewer in finding a program, channel number, or network by using a 10-key keypad as typically found on remote control handsets. The keypad has ten numerical keys, which also correspond to associated letters. When the viewer presses a key, the viewer might intend to be entering a number to find a channel, or one of the letters associated with the key for spelling the program or network name. Regardless of the viewer's intent, the data generated when the key is depressed is the same. The EPG is configured to interpret the data as representing all possible choices, including the number and letters associated with the key. For instance, when a viewer depresses the number "5" key, the EPG interprets that data to mean "5" or "J" or "K" or "L." The EPG then identifies programs, channels, and networks which begin with or contains the number or letters. As the viewer continues to enter each digit, the list of programs, channel, and networks dynamically narrows. After a few button presses, the viewer is presented with a short list of possible choices.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exemplary screen illustration of a graphical user interface (UI) window presented by a prior art product which organizes programs into predefined categories.

Fig. 2 is an exemplary screen illustration of a graphical user interface (UI) window presented by the prior art product which assists a viewer in searching the predefined categories to locate certain kinds of programs.

Fig. 3 is a diagrammatic illustration of an entertainment system.

Fig. 4 is a simplified example of data fields in a data structure maintained by an electronic program guide (EPG).

Fig. 5 is a block diagram of a viewer computing unit.

Fig. 6 is an exemplary screen illustration of an EPG UI, and particularly, a screen having a scrollable grid with program listings.

Fig. 7 is an exemplary screen illustration of an EPG UI, and particularly, a screen used to help create simple queries for searching the EPG.

Fig. 8 is an exemplary screen illustration of an EPG UI, and particularly, a screen used to help create more advanced queries for searching the EPG.

Fig. 9 is a diagrammatic illustration of how a query filters the program database of the EPG to identify programs satisfying the parameters of the query.

Fig. 10 is a diagrammatic illustration of how a restrictive query filters the program database of the EPG to identify and prevent programs satisfying the parameters of the query from being displayed.

Fig. 11 is an exemplary screen illustration of an EPG UI, and particularly, a screen used to manage queries for multiple viewers.

Fig. 12 is a diagrammatic illustration of how individual queries can be merged into a composite query used to search the program database of the EPG.

Fig. 13 is a diagrammatic illustration of how program information is filtered through multiple queries to provide a short set of programs that are ultimately displayed to the viewer.

Fig. 14 is a diagrammatic illustration of how program information in an EPG database and other content information in a Web cache are filtered using multiple queries to provide a short set of programs that are ultimately displayed to the viewer.

Fig. 15 is an exemplary screen illustration of an EPG UI, and particularly, a screen used to locate a particular channel, network name, or program name and to create queries which search for them simultaneously.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 3 shows an entertainment system 40 according to one implementation of this invention. System 40 includes a centralized headend or content provider 42 which is configured to provide continuous video content programs to multiple subscribers. Programs provided by content provider 42 might include traditional broadcast TV shows, on-demand movies, games, and other services such as those commonly provided in the past by on-line computer services.

The content provider 42 supplies video and other data over a distribution network 44 to the subscribers. In this implementation, the network 44 is a satellite network which transmits the data in a digital format from the content provider directly to individual subscribers. The satellite network 44 includes a transmitter 46, an orbiting satellite 48, and a receiver 50. As one example, the satellite network 44 can be implemented using DSS (Direct Satellite System) technology, where individual subscribers own small 18" receiving dishes 50 which are resident at their homes. Video, audio, and other data are transmitted in digital format from the satellite transmitter 46 to the orbiting satellite 48, where the data are redirected to the satellite receiver 50.

The distribution network 44 can be implemented in other ways instead of DSS technology. One implementation is a multi-tier network which includes a high-speed, high-bandwidth fiber optic cable network between the content provider 40 and regional distribution nodes (not shown), and conventional home

entry lines, such as twisted-pair lines or coaxial cable, between the distribution nodes and viewer computing units 60. Anther network implementation might include traditional RF broadcast technologies. The network can also be constructed using a combination of wireless and wire-based technologies.

Another approach beside to broadcasting the content to the subscribers is by multicasting the content over the Internet. With this approach, the content providers transmit the data content to a designated multicast address on the Internet. Subscribers listen to the multicast address to receive the primary content.

Each subscriber residence has at least one viewer computing unit 60. In the illustrated implementation, the viewer computing unit 60 is embodied as a broadcast enabled personal computer, or simply "broadcast PC." The broadcast PC 60 has a large computer monitor 62, a processing unit 64, and input devices in the form of remote keyboard 66 and/or remote control handset 68. The remote keyboard 66 and handset 68 are remotely coupled to the processing unit 64 via a wireless data link 70, such as infrared (IR) or radio (RF), although the remotes can be directly connected. The broadcast PC 60 also includes an EPG database 72 and a content separator 74, which are shown separately for illustration purposes, but can be incorporated into the processing unit 64.

It is noted that the viewer computing unit 60 can be implemented in other forms. For instance, the viewer computing unit 60 can be embodied as a set-top box coupled to a conventional television. Another implementation includes a TV or other visual display device, which has processing components incorporated therein.

Content provider 42 is configured to originate the broadcast programs or to rebroadcast programs received from another source, such as a satellite feed or

another cable system. In addition, the content provider 42 is configured to maintain a database of programs 80, such as feature-length movies, past TV shows, games, and other entertainment videos, which can be played individually to requesting subscribers in an on-demand mode. These programs can be requested via a back channel, such as a telephone link or Internet link (described below). In the case of a cable based network, the cable might function as both distribution channel and back channel to support interactivity. As technology continues to improve, the receiver 50 might be replaced with a transceiver which is capable of both receiving digital data from the satellite system, and transmitting data back across the satellite system.

The content provider 42 includes a continuous media server 82 which distributes the digital video data streams kept in the programs database 80. The continuous media server and video program database are implemented, for example, as a disk array data storage system consisting of many large capacity storage disks. The video data streams of the movies are stored digitally on the storage disks in predetermined or mapped locations. The locations of the video data streams are kept in a memory map and each video data stream is accessed through pointers to the particular memory location. The continuous media server can service simultaneous requests for a program (even the same program) from many viewers.

The content provider 42 also has an program information server 84 to serve programming information to the viewer computing unit 60. The program information server 84 is implemented as a structured query language (SQL) database 86 with records containing information relating to available shows or programs.

Fig. 4 shows an example data structure 88 for organizing programming information within the EPG database 86. The data structure includes various data fields 90 for holding programming information. The data fields contain program titles, actor names, whether the program has closed captioning or stereo audio, the scheduled time of the program, the network name, description text, and the like. The data structure 88 holds pointer to locations within the storage subsystem of the continuous media server 82 which identify storage locations of the programs corresponding to the program records.

The data structure 88 might also contain target specifications (memory pointer, hyperlink, etc.) to one or more target resources which maintain supplemental content for the programs. The supplemental content can be stored at, and served from, the content provider 42 or from an independent service provider. The supplemental content can be text, hypermedia, graphics, video, picture, sound, executable code, or other multimedia types which enhance the broadcast program. Examples of possible supplemental content include interactive questions or games related to the program, additional trivia on the movies or TV shows, advertisements, available merchandise or other memorabilia, Web pages to programs of similar type or starring the same actors/actresses, and so on.

With reference again to Fig. 3, the content provider 42 broadcasts multiple programs for different networks and channels as one continuous digital data feed, as is conventional in DSS. The EPG programming information is transmitted along with the video and audio data. The data is compressed and placed in digital transport packets for transmission over the satellite system. If desired, the data pertaining to particular channels or programs can be scrambled. The receiver 50 de-scrambles and decompresses the data stream, and then reconstructs the video,

audio, and programming data from the digital transport packets. The content separator 74 separates the video and audio data from the programming information. The video/audio data is directed to a tuner in the viewer computing unit 60 which selects a particular channel and displays the video on the monitor 62 and plays the corresponding audio. The viewer controls program selection using the keyboard 66 or remote control handset 68. The programming information is input to the EPG database 72. By caching the programming information in the local EPG database 72, interactive functionality used to locate and select certain programs from the EPG is handled locally.

The entertainment system 60 also includes an independent service provider (ISP) 92 which distributes digital content to the viewer computing unit 60 over a second network 94. An example of the second network 94 is a public network, such as the Internet. The ISP 92 has an ISP host 96 and a content database 98 to serve various multimedia content to the user. For instance, the ISP host 96 might store one or more target resources (such as a Web page) that can be rendered by the viewer computing unit 62.

According to the Fig. 3 arrangement, the viewer computing unit 60 receives traditional broadcast, on-demand programs, and programming information from the content provider 42. The viewer computing unit 60 also receives supplemental interactive content from the content provider 42 or from the independent service provider 92. The back channel for facilitating interactive control is provided through network 94. The off-site supplemental information provided by the ISP 92 is correlated with the programs within the program records data structure 88 in program information server 84. As shown in Fig. 4, programs with supplemental

content provided by other servers has a target specification listed in one of the data fields.

Fig. 5 shows an example implementation of the viewer computing unit 60 in more detail. It includes a mother board 100 having a processor 102 (e.g., x86 or Pentium® microprocessor from Intel Corporation), a volatile memory 104, and a program memory 106. The viewer computing unit 60 includes a digital broadcast receiver 50, such as a satellite dish receiver (Fig. 3). The digital receiver 50 receives digital data broadcast over the satellite distribution network 44. The receiver 50 is coupled to a tuner 110 which tunes to frequencies of the satellite transponders in the satellite distribution network. The tuner 110 has one or two primary components: a specialized digital broadcast tuner and/or a generalized digital broadcast tuner. The specialized digital broadcast tuner is configured to receive digital broadcast data in a particularized format, such as MPEG-encoded digital video and audio data. The generalized digital broadcast tuner is configured to receive digital data in many different forms, including software programs and programming information in the form of data files.

The tuner 110 is connected to the mother board 100 via a multi-bit bus 112, such as a 32-bit PCI (Peripheral Component Interconnect) bus. The EPG database 72 is shown connected to the PCI bus 112, but can alternatively be implemented as part of a hard disk drive 146. The programming data received at the receiver 50 is transferred over the PCI bus 112 to the EPG database 72. A decryption device (not shown) for facilitating secure access to the broadcast enabled PC may also be attached to the bus 112.

The viewer computing unit 60 has a video subsystem 114 connected to the PCI bus 112. The video and audio data is transferred from tuner 110 over PCI bus

112 to the video subsystem 114. The video subsystem 114 includes circuitry for decoding MPEG-encoded or other video data formats, although such circuitry can alternatively be incorporated into the tuner 110 or motherboard 100. The video subsystem 114 also includes video display drivers for driving a computer monitor 116.

The video subsystem 114 supports many peripheral devices, in addition to the monitor 116. For instance, the video subsystem 114 might be connected to a laser video player 118 for playing DVD (digital video disks), a game machine 120 for playing video games, and a VCR (video cassette recorder) 122 for recording programs. The video subsystem 114 is adapted for connection to an analog broadcast television system 124 to receive conventional TV signals from cable television or RF broadcast television systems. This enables backwards compatibility to analog TV systems.

The monitor 116 is preferably a VGA or SVGA monitor as is customary for personal computers, as opposed to a standard television. In the illustrated implementation, the viewer computing unit 60 does not convert the television-related data into an NTSC (National Television System Committee) format. In this manner, the viewer computing unit 60 is able to produce television data having superior quality when displayed on the VGA monitor.

The viewer computing unit 60 also includes a second bus 130, such as an ISA (Industry Standard Architecture) bus, coupled to the mother board 100. An audio board 132 is coupled to the ISA bus 130 and serves as an interface with a number of audio output devices, such as conventional speakers. An amplifier may be coupled between the audio board and speakers if desired. The audio board is also coupled to the video subsystem 114 to receive decoded audio signals. The

audio board 132 can be coupled to a stereo system 134, so that audio data can be output to the stereo system for enhanced sound and recorded.

A CD ROM drive 136 is coupled to the ISA bus 130. The audio output produced by the CD ROM drive 136 is passed to the audio board 132.

The viewer computing unit 60 includes a modem 138, such as a 14.4 or 28.8 kbps fax/data modem, coupled to the ISA bus 130. The modem 138 is connected to a conventional telephone line and provides access to public networks, including the Internet. The modem 138 can be used to access and download data and supplemental content directly from an independent service provider. Additionally, the modem 138 can be used for two-way communications with the content provider serving the programs over the DSS network. Viewer requests for programs can be transmitted over the back channel via the modem 138.

An input/output (I/O) adapter 140 is coupled to the ISA bus 130 to interface with numerous I/O devices , including a digital tape driver 142, a floppy disk drive 144, and a hard disk driver 146. A remote receiver 148 is also coupled to the I/O adapter 140 for receiving signals from the remote cordless keyboard 66 and remote control handset 68 in an IR or RF format. Alternatively, the keyboard and handset can be directly wired to the computer. The I/O adapter 140 further provides conventional serial ports, including a COM1 port 150, a COM2 port 152, and an LPT1 port 154. An IR transmitter (not shown) can be coupled to the COM1 port 150 to generate infrared signals to control electronic devices, such as stereo equipment, VCR, and the like. The computer 60 can also be hooked directly to these components.

The viewer computing unit 60 runs an operating system 160 which supports multiple applications. The operating system 160 is loaded in memory 106 and

executes on the processor 102. The operating system 160 is preferably a multitasking operating system which allows simultaneous execution of multiple applications. The operating system 160 employs a graphical user interface windowing environment which presents the applications or documents in specially delineated areas of the display screen called "windows." One preferred operating system is a Windows® brand operating system sold by Microsoft Corporation, such as Windows® 95 or Windows® NT or other derivative versions of Windows®. The remote keyboard 66 and handset 68 may include customized keys suitable for use with a Windows® brand operating system. It is noted, however, that other operating systems which provide windowing environments may be employed, such as the Macintosh operating system from Apple Computer, Inc. and the OS/2 operating system from IBM.

A channel navigator application 162 is stored in program memory 106 and executes on the processor 102 to control the tuner 110 to select a desired channel for receiving the video content programs. An EPG application 164 is stored in program memory 106 and executes on the processor 102 to organize programming information downloaded from the Program information server at the content provider and cached in the EPG database 72. The EPG 104 supports a displayable user interface (UI) which visually presents the programming information from the EPG database 72 in a usable format for the viewer, as will be described below with reference to Fig. 6. The EPG is also configured to enable the viewer to define queries which intelligently identify and gather programs the viewer would like to see.

The viewer computing unit 60 has a browser 166 which is kept in memory 106 and dynamically loaded on processor 102 when needed to render content, such

as a hypertext document, from an ISP or other content provider. The browser166 can be implemented as a hyperlink browser, or more particularly, as an Internet Web browser.

It is noted that the operating system and applications can be stored on the hard disk driver 146, or other storage medium (floppy disk, CD ROM, etc.), and loaded into the program memory for execution by the processor.

It is further noted that the broadcast enabled personal computer 60 is a fully functional computer which can perform the typical desktop applications familiar to computers. A variety of different applications can be loaded and executed on the viewer computing unit. As an example, the viewer can run word processing applications, spreadsheet applications, database applications, scheduling applications, financial applications, educational applications, and so forth. The viewer operates the applications using the keyboard 66.

Fig. 6 shows an example EPG UI 170 which is presented on a display 172. The EPG UI 170 includes a channel panel 174, a time panel 166, a program grid 178, and a program summary panel 180. Channel panel 174 provides a vertical scrolling list which displays multiple channel tiles 182 at any one time. Each channel tile 182 includes a channel number and a channel name (typically the network name, such as CBS, ABC, MTV, etc.), and might also include a channel logo. The channel panel 174 defines rows of program titles in program grid 178. Time panel 176 is a horizontal, continuous scrolling time line with markings denoting half-hour time segments. Time panel 176 defines columns in program grid 178.

Program grid 178 consists of multiple program tiles 184 organized in channel-based y-axis and time-based x-axis. The grid is located to the right of

channel panel 174 and below time panel 176. Each program tile 184 has the program title and any secondary program descriptive information, such as closed caption, stereo, etc. The illustrated screen shows an example programming line-up for 8:00 p.m. to 10:00 p.m. PST, Thursday, March 7, 1996. The program titles, such as "Murder, She Wrote" and "Friends," are arranged horizontally with respect to their networks CBS and NBC and vertically with respect to their start times of 8:00 p.m. PST. It is noted that many other grid or non-grid layouts may be employed to present the program selections to the viewer. Additionally, although the layout is shown organized according to channel number, the same information can be presented in a channel absence presentation where no reference is made to channel numbers.

The viewer controls the program selection with a single focus frame 186 which is graphically overlaid on the program grid 178. Focus frame 186 can be moved up or down, or left and right within a channel line-up, to choose a desired program. The remote control handset or keyboard (or other manipulating mechanism) can be used to position the focus frame 186 within the EPG UI 170.

Program summary panel 180 includes a text description window 188 and a preview window 190. The text description window 188 displays program information related to the program that is highlighted by the focus frame 186 in program grid 178. Here, the NBC program "Seinfeld" is highlighted and the text description window 188 lists the program title "Seinfeld," and a program description of the current episode. The text description window 188 might also include other program related information like closed-captioning, stereo, etc. The preview window 190 is used to display clips of the selected highlighted show, such as a preview of the "Seinfeld" show.

The data to fill the various tiles and windows is drawn from the EPG database 72 or from URL resources on the Internet 94. The data is maintained in data structure 88 (Fig. 2) which is transmitted as program records from the content provider over the satellite network to the viewer computing unit and cached in the EPG database 72. The EPG application 164 inserts the appropriate data records into the EPG UI 170 for display as the viewer maneuvers the focus frame 186 around the grid.

The EPG UI 170 also includes hyperlinks 192 which are supplied with the program records received from the content provider, embedded in the program stream, or provided in a data stream from arbitrary source which has been associated with the program. The hyperlinks can be inserted into the channel tiles 182, program tiles 184, or the description window 188. In the Fig. 6 illustration, the hyperlink "More" is provided in the description window 188 to reference target resources that contain additional information about this episode of the "Seinfeld" show. Other hyperlinks in the description window 188 include "Last Week" which references a target resource containing information on the previous week episode, and "Comedy Club" which links to a target resource having video coverage of comedian Jerry Seinfeld performing at night clubs. The target resources referenced by the hyperlinks might be located at the content provider or at an independent service provider. The target resource might further be located locally, having been pre-cached by the system. For instance, the system might pre-cache supplemental information about certain shows before they air based on predictive viewing tendencies, or as part of a promotional data broadcast advertising the show. This permits local interactive functionality between the

viewer and the viewer computing unit, in addition to full network interactive functionality between the viewer and the program provider.

The EPG UI 170 has special operator buttons 194-200 which arrange for certain tasks. A "view full screen" button 194 allows the viewer to view the program in full screen. A "record" button 196 allows a user to initiate procedures to record a currently playing program, or schedule to record an upcoming program. For scheduling, the viewer simply drags the record icon and drops it on a program tile 184 of an upcoming program, as exemplified by the record icon dropped on the "Caroline in the City" program tile.

A "remind" button 198 is used to set reminders which notify viewer's of scheduled shows. A viewer might, for example, want to be reminded of a program being played later in the day and hence, drag a reminder icon to the suitable program tile 184. When the start time of the requested program approaches, the EPG will notify the viewer through a pop-up icon or the like that the program is about to begin. An "add to favorite" button 200 is provided to enable a viewer to add a program to a predefined list of favorites.

The drag and drop aspects described above are preferably implemented using object linking and embedding (OLE), which is commercially available from Microsoft Corporation under a technology known as "ActiveX." OLE is an extensible service architecture built on the Component Object Model (COM) which is both language independent and location independent. OLE supports an OLE Drag and Drop which is widely used in Windows®-compatible operating systems, such as Windows® 95. OLE and COM have been well documented and will not be explained in detail. For more information regarding OLE and COM, refer to OLE 2 Programmer's Reference and Inside OLE 2, Second Edition, both

published by Microsoft Press of Redmond, Washington, and both of which are hereby incorporated by reference.

The EPG UI 170 also presents predefined query buttons 202-210. Activation of these query buttons trigger a query of the EPG database 72 to identify programs satisfying the predefined query parameters. The EPG 106 enables a viewer to create their own queries and to produce a soft button on the EPG UI 170 for quick retrieval of highly used queries. As an example, the EPG UI shows queries for favorite programs, Star Trek programs, comedies, the Oprah Show, and old movies. The "favorites" query button 202 recalls a list of programs that the viewer has previously identified as favorites using the "add to favorite" button 200, or which have been automatically defined as favorites by the EPG. The "Star Trek" query button 204 and "Oprah" query button 208 initiate queries of the EPG database 72 for all Star Trek and Oprah shows that might be playing within a particular time frame. As the number of channels increases and programming grows dramatically, several different channels might carry Star Trek or Oprah, concurrently or at different times. The "comedies" query button 206 initiates a query of the EPG database 72 for all comedy programs. The "old movies" query button 210 locates all old movies that are showing.

Some of the predefined query buttons are preset categories, such as the "comedies" and "old movies" buttons, while other query buttons are defined by the viewer, such as "Star Trek" and "Oprah" buttons. The preset category buttons can be added and removed from the EPG UI through a separate window which allows a viewer to add or subtract categories from a list of available categories.

According to one aspect of this invention, the EPG 164 is configured to automatically develop queries to identify programs that a viewer is likely to want

to watch based on viewing preferences of the viewer. The EPG application collects viewer preferences in a number of ways. One technique is to log the amount of time that each channel is selected for viewing, with the underlying assumption that the viewer is watching that channel. Each channel is then assigned its own percentage of the entire viewing period as an indication of the viewer's preferences. The EPG generates a query to identify channels based upon this percentage, so that channels which the viewer tends to watch most often appear at the top of the list and channels which the viewer tends to watch least often appear at the bottom of the list. The EPG presents this list as a scrollable list in the EPG UI , with the highly watched channels appearing at the top and the least watched not appearing at all, but being available if the viewer wanted to scroll to them. It is noted that the same technique can be applied to individual programs or networks, where each program or network (rather than channel) is logged and the list is ordered with the frequently watched programs being listed on top and the least watched programs being listed on the bottom.

Another technique is to create a viewer profile for each viewer. The viewer is asked a series of questions directed at discovering the viewer's likes and dislikes. This question-and-answer session is accomplished using a separate graphical UI which asks questions and enables viewers to choose among responses, such as "strongly like," "like," "dislike," and "strongly dislike." Rather than discrete answers, the question-and-answer screen might include sliders which enable viewers to choose somewhere in a scale between opposing preferences of "strongly dislike" and "strongly like." The EPG compiles the viewer profile and correlates the profile with clustering data to generate a query for possible programs. The clustering data represents an accumulation of other viewers

preferences. By matching the viewer profile with similar profiles, the EPG can better determine what the viewer will most likely want to watch.

Once the EPG 164 has automatically compiled a list of likely favorites, the EPG presents the list in a UI screen. This screen can be called, for example, by activating the "favorites" button 202 in EPG UI 170. The list is presented as its own reduced, closed loop of available programs which has actively weeded out less popular channels. The viewer can then surf the closed list by sequentially cycling through the programs.

The EPG UI 170 also presents a "Find" button 212 which a viewer uses to create his/her own query. Activation of the "Find" button 212 opens another UI window which assists a viewer in creating a query. Fig. 7 shows an example find window 220. The find window 220 presents various search parameters for the viewer to search. In this example, the viewer can select a program genre from a genre box 222, a program sub-genre from a sub-genre box 224, a rating from the rating scale 226, a network name from the network box 228, and a program name from the program box 230. Based on these parameters, the EPG constructs a query and searches the EPG database 72 to locate programs satisfying the query. The find window supports creation of two mutually exclusive types of queries: a "find" query which locates all programs satisfying the search parameters and a "find all except" query to locate all programs which do not satisfy the parameters. In this example, the EPG has constructed a "find" query which located three programs that satisfy the parameters of an action movie rated PG.

To produce more advanced queries, the viewer can select an advanced query button 232. Fig. 8 shows an example advanced find window 240. It enables a viewer to create particularized queries and organize them in a tabbed folder

arrangement. In this example, the viewer has defined three advanced queries pertaining to "G-rated" programs, "Action" programs, and "No Sci-Fi" programs. The advanced find window 240 includes parameters such as genre, sub-genre, rating, network name, channel, program name, and time period. As new parameters are added to the EPG database, new controls in the advanced find window 240 are likewise added. It also allow a viewer to define a keyword. In this example, the viewer wants to find all James Bond action movies on HBO between 5:00 PM and 8:00 PM. Hence, the viewer enters the keyword "Bond" and executes the query. If the viewer wanted to find a particular bond movie starring Sean Connery, the viewer might enter a Boolean-like search "Bond AND Connery" in the keyword control of the advanced find window.

The advanced find window 240 can also be used to create restrictive queries which function to restrict or limit selection of programs for viewers without appropriate permissions levels. For instance, parents can set permission levels for their children so that when the children are logged onto the viewer computing unit, the children are prevented from watching certain programming content or from ordering certain services. A parent might, for example, wish to restrict a child from watching an R or NC rated movies. To create a restrictive query, the parent clicks the "don't find" option to convert the query from an inclusive query to an exclusive query.

An "add tab" button 242 and "remove tab" button 244 allow the viewer to manage the queries. The viewer can also save queries by clicking on the "save" button 246. Preferably, the queries are saved in a hierarchic query structure of the EPG database. This enables viewers to define directories and sub-directories of queries. Organizing queries in a hierarchic structure is advantageous because the

structure conforms to the computer side of the viewer computing unit and avails itself to memory management applications and tools running on the computer. As the number of saved queries grow, the query directories can be searched like other data files directories, as is common in personal computers, to locate a particular query. The query structure can also be presented in a UI to the viewer as an organization chart showing the hierarchy of directories, sub-directories, and queries. Individual queries can be saved as icons. To recall the query, the user activates the icon.

The EPG can also be configured to support a query editor to allow the viewer to create essentially any type of query based on key word descriptions, and to edit such queries. One suitable type of editor which can be employed with the EPG is a query editor used in a program entitled Cinemania95 by Microsoft Corporation, which enables a computer user to create queries for locating cinema trivia stored on the CD ROM.

To assist the viewer in defining a query (either by using the "Find" UI or the query editor), the EPG can provide wizards which guide the viewer with step-by-step instructions through the query creation. One example wizard for generating a simple query is to ask the viewer if the program selected is chosen for its name, or for its channel. A viewer might request to always be shown any program with one name, or to never display a program with another name.

Once a query is defined, the viewer can execute the query to initiate a search of the programming information in the EPG database 72. The queries function as a filter which sifts through the programming information and returns only those items which satisfy the parameters, or in the case of a restrictive query, precludes those items that satisfy the parameters.

Fig. 9 is a diagrammatic illustration of how a query operates to filter out programs which do not satisfy the criteria. Box 250 contains a representation of programs found in the EPG database 72. Suppose a viewer defined a science fiction (Sci-Fi) query using the advanced find window 240, as shown in Fig. 8, to locate Sci-Fi programs. The EPG application 164 executes the Sci-Fi query 252 and winnows the program database to a short list of Sci-Fi programs, as presented in box 254. This short list of Sci-Fi programs is then presented in the UI as a closed loop list which can be cycled by the viewer for selection of a particular program.

Fig. 10 demonstrates a restrictive query which functions to filter out and remove programs which are prohibited under the query. In this example, the EPG applies a restrictive query filter 256 to the program set 250 in the EPG database which eliminates programs rated PG or R. The short list provided in box 258 is without PG or R rated programs.

Figs. 11 and 12 illustrate another aspect of this invention in which the EPG is configured to merge multiple queries into a unified query. Suppose, for example, that multiple members in a family want to watch a program together, but are not sure which program. Typically, each family member individually scans the program listings, or surfs the channels, to find one or two programs they are most interested in watching. After everyone is through with his or her independent search, they discuss about which program to watch. The EPG 164 eliminates this problem by creating complex composite queries which merge multiple simple single queries.

Fig. 11 shows an example UI window 260 having a folder organization which maintains queries for individual viewers. In this example, a family of

four—Dad, Mom, John, and Sue—each have their own tab and folder which lists their personalized queries. That is, each family member has previously defined one or more queries and stored them in their personal folder. The Mom folder holds queries for musical programs, programs on France, and the Seinfeld program. Table 1 shows the queries for all family members.

Table 1: Family Queries

Family Member	Queries
Dad	Sports, Comedies
Mom	Musicals, France, Seinfeld
John	Star Trek, Action
Sue	Cartoons, No R-rated

When the family sits down to watch a program together, one viewer can execute a merge query that effectively combines these independent queries using, for example, an OR function. The Boolean OR function returns a true result if any one of the parameter sets is met. In Fig. 12, a program set 262 is filtered using Dad's query filter(s) 264, Mom's query filter(s) 266, John's query filter(s) 268, and Sue's query filter(s) 270. The programs satisfying at least one of these queries is placed in the program pool 272, from which the family members can choose a program. It is noted that the family filter can be alternatively set to combine using a set intersect method or Boolean AND function which returns a program only if the query parameter sets of each family member is met.

Notice that some programs are listed because they satisfy a single query (e.g., US Open Golf is selected by Dad's query filter 264). Other programs may

satisfy more than one query. For example, the program "Seinfeld" satisfies Mom's Seinfeld query and Dad's comedies query. The animated movie "Aristocats" satisfies Mom's France query and Sue's cartoon query.

Fig. 13 illustrates the data flow for the programming data used by the EPG application, and how the query filters act to pare the data. Suppose that the viewer is watching the viewer computing unit 60 at 1:00 PM, as indicated by the clock 280. Broadcast digital video and audio data, along with the digital programming data, are received from the satellite system at satellite receiver 50. The programming data is cached in the local EPG database 72. In this illustration, the EPG database is shown as having twelve programs with start times ranging from 1:00 PM to 8:00 PM. This represents a tiny fraction of available programs, as the EPG database 72 can store thousands of programs that are available over hundreds to thousands of channels.

The viewer has defined a restrictive query 282 that removes all Sci-Fi programs from the active EPG UI 170. In this case, the programs "Star Trek," "Aliens," and "Star Wars" are eliminated from the EPG UI 170. Now, suppose the viewer decides to watch CNBC Market Wrap at 1:00 PM. The viewer selects the program by highlighting and clicking on the Market Wrap program tile in the EPG UI 170. The tuner in the viewer computing unit tunes to the channel carrying the selected program and the digital video data for Market Wrap is sent to the VGA monitor.

According to another aspect of this invention, the viewer can define queries that continue to execute in background. The viewer defines the query to identify a topic of interest, such as any programs concerning the Great Wall of China or any programs starring Clint Eastwood. The query is stored and periodically executed

to determine if there are any programs which relate to the topic. When the query identifies a program related to the topic, the EPG automatically notifies the viewer.

Fig. 13 shows two queries that execute in background. The first query 284 identifies and notifies the viewer of all "Seinfeld" programs and the second query 286 identifies and notifies the viewer of all Clint Eastwood movies. When the viewer looks at the upcoming schedule for 2:00 PM, the EPG UI 288 shows all programs from the filtered version of the EPG UI 170 which show at 2:00 PM, such as the US Open Golf and Seinfeld. The EPG UI 288 also shows any programs identified by the background queries as a result of searching the EPG database 72. Here, the background queries 284 and 286 identified a Seinfeld program playing at 2:00 PM and a Clint Eastwood movie "Pale Rider" at 6:00 PM. Since there is a conflict at 2:00 PM, the viewer can choose between the Seinfeld program and the US Open Golf program.

Since the movie Pale Rider is not until 6:00 PM, the viewer can place a notification icon 290 on the screen to remind him/her of the program. The viewer clicks on the program, drags it from the EPG UI 288, and drops it at another location on the screen. The drag-and-drop operation results in creation of an instruction to tune the visual display unit to the program upon activation of the icon. The EPG can flash the icon, or cause some other visual change, when the start time of the program nears.

The EPG can also automatically create these reminders, without intervention of the viewer. When the EPG identifies a program, such as Pale Rider in response to the background query 286, the EPG can be configured to automatically set an icon 290 on the screen for the viewer. The viewer can also set an option for the EPG to initiate recording of the program in the event that the

viewer does not timely activate the icon prior to the scheduled viewing time. In this manner, if the viewer is unable to watch the program at the schedule time, the EPG intelligently queries the database for upcoming programs, identifies any programs that meet the viewer's search parameters, notifies the viewer, and records the program if the viewer is unable to watch it. There are other triggerable events that may be set based on the queries, such as automatically downloading information about the identified program, calling particular content from the Web, or launching a purchasing application to purchase goods related to the identified program.

This example illustrates concurrent use of multiple filters including personal background filters and an active general filter. The EPG can be configured to perform any number of queries, such as any restrictive queries for the logged on viewers, then any general queries, and then any background queries to filter the programs found in the EPG database to a manageable set of preferred programs.

Another aspect of this invention is to provide queries which filter information from the EPG database and from one or more Web sites on the Internet. The query results can be presented to the user in a single UI. The queries for the Web sites or other information on the Internet can be active queries that readily filter during online communication with the Internet, or queries that filter information in a local cache filled with Internet data.

Fig. 14 is similar to the arrangement of Fig. 13, but shows the effect of queries operating on both the EPG database and an Internet Web site. Fig. 14 shows two queries, an EPG database query 282 which filters data in the EPG database 72 to remove all science fiction programs and a Web cache query 292

which filters a Web cache 294 to locate only news programs. The Web cache 294 contains recently retrieved from one or more Web sites on the Internet.

The results of the two queries are displayed together on UI 296 to present a list of options to the viewer. The viewer can optionally select programs served by the content provider over the primary distribution network, or content served by the Internet provider over the Internet. By using an integrated UI 296, the viewer might be unaware as to the source of the content.

Fig. 15 shows a quick find window 300 supported by the EPG application 164 which presents another technique for creating a query. This technique enables a viewer to enter data from a numeric keypad on the remote control handset. The numeric keypad is a conventional 0-9 digit keypad. Numbered keys 2-9 also have letters associated with them, similar to a conventional telephone, except the number "7" key includes the letter Q and the number "9" key includes the letter Z. Table 2 shows the association of the numbered keys and letters.

Table 2: Association of Letters to Numbered Keypad

Key	Associated Letters
1	
2	A, B, C
3	D, E, F
4	G, H, I
5	J, K, L
6	M, N, O
7	P, Q, R, S
8	T, U, V

9	W, X, Y, Z
0	

Suppose a viewer wants to watch a particular program or network, but cannot remember what channel it is on. Remember, there are expected to be hundreds or thousands of channels, and trying to locate a particular program or network by memorizing each channel number may prove futile. To decouple the association of channel numbers to networks and programs, the EPG enables the viewer to enter data from the 10-key keypad for both channel numbers or letters in the program or network name. The EPG performs the mapping to identify any program, channel, or network that matches the entered data.

The quick find window 300 is activated by pressing one of the keys on the remote control handset. With quick find active, the viewer presses individual keys on the remote control handset to enter data, one digit at a time. As each key is depressed, however, the EPG does not know if the viewer intends to enter a number or a letter. Accordingly, for each key, the EPG constructs a query which interprets the data as possibly representing a number or one of the letters associated with the numeric key. The EPG then executes the query to identify any EPG data item (i.e., channel, program, network, etc.) that satisfies the query. As the viewer continues to enter digits, the EPG constructs and executes queries to continuously narrow the list until only a few EPG data items satisfy them.

With reference to the example shown in Fig. 15, suppose the viewer is interested in watching the Orlando Magic basketball team. The viewer activates the quick find window 300 and begins entering the word "Magic." The viewer first depresses the "6"-key, which has the associated letters M, N, and O, to enter

the letter "M" in "Magic." The EPG constructs a query for all EPG items beginning with the digit "6," "M,", "N," or "O." In Boolean logic terms, the query is represented as follows:

Query 1 = 6* or M* or N* or O*

The symbol "*" means that any digit or digits can follow the number or letter shown. The query returns a long list of items, including the following examples:

Query 1: 6* or M* or N* or O*

MTV

Chicago Bulls at Orlando Magic

Seattle Mariners v. Boston Red Sox

Market Wrap

Magical World of Science

Magic Kingdom at Disney World

Orlando Magic v. Chicago Bulls

Nashville Live

NBC

Nick-at-Night

Outer Limits

Oprah

Channel 6

Channel 61

:

:

The viewer next depresses the "2"-key, which has the associated letters A, B, and C, to enter the letter "a" in "Magic." The EPG constructs a query for all EPG items in the first list having a next digit beginning with "2," "A,", "B," or "C." In Boolean logic terms, the query is represented as follows:

Query 2 = 62* or MA* or MB* or MC* or NA* or NB* or NC*

or OA* or OB* or OC*

The query returns a shorter list of items, including the following examples:

Query 2

Chicago Bulls at Orlando Magic

Seattle Mariners v. Boston Red Sox

Market Wrap

Magical World of Science

Magic Kingdom at Disney World

Orlando Magic v. Chicago Bulls

Nashville Live

NBC

Channel 62

Channel 621

:

:

The viewer next depresses the "4"-key, which has the associated letters G, H, and I, to enter the letter "g" in "Magic." The EPG constructs a query for all EPG items in the first list having a next digit beginning with "4," "G,", "H," or "I." In Boolean logic terms, the query is represented as follows:

Query 3 = 624* or MAG* or MAH* or MAI* or MBG* or MBH* ...
... or OCG* or OCH* or OCI*

The query returns a much shorter list of items, including the following:

Query 3

Chicago Bulls at Orlando Magic
Magical World of Science
Magic Kingdom at Disney World
Orlando Magic v. Chicago Bulls
Channel 624

By entry of the third digit—the letter "g"—the list of possible programs, networks and channels has been dramatically reduced to a short list that can be presented to the viewer. If the viewer continues to enter the letters "i" and "c" in "Magic," the list is pared down to four items shown in the quick find window 300 in Fig. 15. The viewer can then choose a program from the list by clicking on the appropriate program title. In response, the viewer computing unit tunes to the channel carrying the selected program.

An alternative technique to searching on each number or letter is to pre-map the program and network names into associated identification numbers which can be stored as part of the data record in the EPG database. For instance, the network name MTV has an associated identification number "688," where the letter "M" is mapped to the number "6," the letter "T" is mapped to the number "8," and the letter "V" is mapped to the number "8." With this pre-mapped identification number, the EPG can simply search on each numerical data and return all channel numbers, and all programs with identification numbers satisfying the query.

The quick find feature is very useful to the viewer. The viewer need not use the remote keyboard to enter names of programs or networks (although the keyboard may be used). Instead, the viewer enters the data using the 10-key keypad on the remote control handset and the EPG simultaneously considers all possible meanings of the data. Although this may seem laborious, entry of just a few digits (e.g., 3 to 6) is often sufficient to reduce the set of possible channel numbers, programs, and network names to only a few which can be conveniently displayed to the viewer.

The quick find feature is described above as performing a new set of queries after each digit is entered. However, the EPG can be alternatively configured to await entry of multiple digits before performing the queries. For instance, the EPG can keep track of the sequence of entered digits, and the various permutations of possible letter combinations within the sequence, and then subsequently perform queries on those possibilities.

It is noted that the above example describes the viewer as entering data using a keypad on the remote control handset. In other embodiments, the EPG is configured to present a keypad of soft buttons (i.e., buttons shown as part of the

graphical UI on the monitor) which the viewer can select using a handset or some other remote device to enter the data. Additionally, the viewer can enter channel numbers, program names, and network names using the remote keyboard.

It is noted that the term "program" is represented in examples as traditional television shows, or movies. The term "program" is not to be limited, however, to only these forms of programming. The term "program" is to be given a broad meaning, including any type of information or data that can be carried over a network or stored locally. Examples of "programs" include TV-like shows, movies, games, interactive supplemental data, financial records or programs, educational materials, communications records, software, document files, and the like.

The query-base EPG system described herein is advantageous because it effectively decouples the association of channel from network and programs. The viewer can create simple queries to search on prearranged categories or complex queries to search across arbitrary fields. The EPG permits viewers to merge their individual queries into a composite query, which offers tremendous convenience for groups of viewers. The EPG also permits a viewer to save queries in a convenient hierarchic structure. The saved queries can also be loaded into a start menu for execution each time the viewer boots the viewer computing unit.

The invention has been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the invention is not limited to the specific features described, since the means herein disclosed comprise preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the

proper scope of the appended claims appropriately interpreted in accordance with the doctrine of equivalents.

CLAIMS

1. A method for operating an electronic program guide comprising the following steps:

collecting viewing preferences of a viewer; and

developing a query for identifying programs based upon the viewing preferences of the viewer.

2. A method as recited in claim 1, wherein the collecting step comprises the step of monitoring viewing habits of the viewer as an indication of the viewing preferences.

3. A method as recited in claim 1, wherein the collecting step comprises the following steps:

creating a viewer profile of the viewer; and

correlating the viewer profile with other viewer profiles to infer the viewing preferences of the viewer.

4. A method as recited in claim 1, further comprising the step of presenting, to the viewer, a list of programs identified by the query.

5. A method as recited in claim 4, further comprising the step of ordering the list of programs to group programs which the viewer is more likely to watch in one part of the list and programs which the viewer is less likely to watch in another part of the list.

6. A method as recited in claim 1, wherein the collecting step comprises the following steps:

conducting the query; and

assembling the programs identified by the query as a viewer program set through which the viewer can sequentially cycle.

7. A method as recited in claim 1, further comprising the step of saving the query in a hierarchic query structure.

8. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 1.

9. A viewer computing unit programmed to perform the steps of the method recited in claim 1.

10. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 1.

11. A method for operating an electronic program guide comprising the following steps:

logging an amount of time that a particular channel is selected for viewing; and

generating a query to identify channels based upon a percentage of the time that the channels are selected.

12. A method as recited in claim 11, further comprising the following steps:

presenting, to the viewer, a list of the channels identified by the query; and

ordering the channels within the list according to the percentage of time that the channels are selected for viewing so that channels which are selected a higher percentage of the time appear at one place in the list and channels which are selected a lower percentage of the time appear at another place in the list.

13. A method as recited in claim 11, further comprising the step of generating a query to identify channels which have been selected at least a threshold amount of time to eliminate rarely selected channels from identification.

14. A method as recited in claim 11, further comprising the step of saving the query in a hierarchic query structure.

15. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 11.

16. A viewer computing unit programmed to perform the steps of the method recited in claim 11.

17. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 11.

18. A method for operating an electronic program guide comprising the following steps:

defining a first query for identifying programs preferred by a first viewer;

defining a second query for identifying programs preferred by a second viewer; and

creating a unified query which combines the first and second queries to jointly identify the programs preferred by at least one of the first and second viewers.

19. A method as recited in claim 18, wherein the creating step comprises the step of combining the first and second queries according to a logical OR function.

20. A method as recited in claim 18, further comprising the following steps:

conducting a search of programs available on the electronic program guide using the unified query; and

presenting the programs that satisfy the unified query.

21. A method as recited in claim 18, further comprising the step of automatically generating at least one of the first and second queries based upon viewing preferences of the respective first and second viewers.

22. A method as recited in claim 18, further comprising the step of saving the queries in a hierarchic query structure.

23. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 18.

24. A viewer computing unit programmed to perform the steps of the method recited in claim 18.

25. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 18.

26. A method for operating an electronic program guide (EPG) comprising the following steps:

defining a first query for identifying selected programs in an EPG database;

defining a second query for identifying selected programs retrievable from a site on the Internet; and

creating a unified query which combines the first and second queries to jointly identify the selected programs.

27. A method as recited in claim 26, further comprising the step of saving the queries in a hierarchic query structure.

28. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 26.

29. A viewer computing unit programmed to perform the steps of the method recited in claim 26.

30. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 26.

31. A method for operating an electronic program guide comprising the following steps:

defining a query to identify a topic of interest to a viewer;

storing the query;

periodically executing the query to determine if there are any programs which relate to the topic; and

automatically notifying the viewer when the query identifies a program related to the topic.

32. A method as recited in claim 31, further comprising the step of automatically initiating procedures to record the program related to the topic.

33. A method as recited in claim 31, further comprising the step of saving the query in a hierarchic query structure.

34. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 31.

35. A viewer computing unit programmed to perform the steps of the method recited in claim 31.

36. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 31.

37. A method for operating an electronic program guide (EPG) as a viewer uses one or more numeric keys to enter data, individual ones of the keys also corresponding to one or more associated letters, comprising the following steps:

constructing a query, based on the entered data, which considers that the entered data might represent a number or a letter associated with the numeric key used to enter the data; and

identifying any EPG data item that satisfies the query.

38. A method as recited in claim 37, further comprising the additional step of repeating the steps of constructing and identifying for each key entry.

39. A method as recited in claim 37, wherein the steps of constructing and identifying are performed after multiple key entries.

40. A method as recited in claim 37, further comprising the additional step of presenting, to the viewer, said any EPG data item which satisfies the query.

41. A method as recited in claim 37, wherein the constructing step comprises the following steps:

formulating one or more letter sub-queries for each letter corresponding to the key used for entry;

formulating a number sub-query for each number corresponding to the key used for entry; and

formulating the query as a combination of the letter and number sub-queries.

42. A method as recited in claim 37, wherein the data is a result of more than one key entry, and the constructing step further comprises the following steps:

interpreting the data for each key entry as representing both the number and the associated letters corresponding to the key;

formulating multiple sub-queries for each sequence of key entries which considers different interpretations of the data within the sequence; and

formulating a composite query as a combination of all the sub-queries.

43. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 37.

44. A viewer computing unit programmed to perform the steps of the method recited in claim 37.

45. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 37.

46. In a viewing computing unit which can be controlled through a numeric keypad having numbered keys, the keys further corresponding to one or more associated letters, a method comprising the following steps:

generating key data as a key is activated;

interpreting the key data as representing both a number associated with the key and the one or more letters associated with the key; and

determining possible operations which can be performed by the viewer computing unit for different interpretations of the key data.

47. A method as recited in claim 46, wherein the numbers are used to identify a channel and the letters are used to identify a program or network name, the method further comprising the step of mapping the one or more letters associated with the key to the number associated with the key so that the channels, the program names, and the network names are all identified by numerically encoded key data.

48. A method as recited in claim 46, further comprising the additional step of repeating the steps of generating, interpreting, and identifying as each key is activated.

49. A method as recited in claim 46, wherein the interpreting and determining steps are performed only after the step of generating key data has been performed for all activated keys.

50. A method as recited in claim 46, wherein the interpreting step comprises the following steps:

formulating one or more letter sub-queries for each of the one or more letters associated with the key;

formulating a number sub-query for the number associated with the key; and

formulating a composite query as a combination of the letter and number sub-queries.

51. A method as recited in claim 46, wherein more than one key is activated, further comprising the following steps:

generating a sequence of key data;

formulating multiple sub-queries for the sequence of key data which considers the different interpretations of the key data within the sequence; and

formulating a composite query as a combination of all the sub-queries.

52. A method as recited in claim 46, further comprising the step of saving the query in a hierarchic query structure.

53. A viewer computing unit programmed to perform the steps of the method recited in claim 46.

54. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 46.

55. A method for operating an electronic program guide comprising the following steps:

creating a restriction query having one or more search parameters; and

precluding selection of any program, channel, or network which satisfies the search parameters in the restriction query.

56. A method as recited in claim 55, wherein the search parameters are selected from a parameter group comprising genre, sub-genre, rating, time of day, and length of time watched.

57. A method as recited in claim 55, further comprising the step of saving the query in a hierarchic query structure.

58. A method as recited in claim 55, further comprising the step of saving the query as an icon.

59. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 55.

60. A viewer computing unit programmed to perform the steps of the method recited in claim 55.

61. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 55.

62. A method for operating an electronic program guide comprising the following steps:

creating queries for locating a program, channel, or network; and

saving the queries in a hierarchic query structure.

63. A method as recited in claim 62, wherein the saving step comprises saving the queries as icons.

64. A method as recited in claim 62, further comprising presenting, to a viewer, a organization chart representing the hierarchic query structure.

65. A method as recited in claim 62, further comprising retrieving a query from the hierarchic query structure.

66. An electronic program guide resident in a computer-readable storage medium and executable on a processor to perform the steps of the method recited in claim 62.

67. A viewer computing unit programmed to perform the steps of the method recited in claim 62.

68. A computer-readable storage medium which directs a computer to perform the steps of the method recited in claim 62.

69. A computer-readable storage medium having a hierarchic query structure stored therein which is formed as a result of the steps of the method recited in claim 62.

70. A viewer computing unit, comprising:

a processor; and

an electronic program guide (EPG) executing on the processor to organize programming information descriptive of programs, the EPG being configured to collect viewing preferences of a viewer and to automatically develop a query for identifying programming information based upon the viewing preferences of the viewer.

71. A viewer computing unit as recited in claim 70, further comprising a memory to store a profile of the viewer which indicates the viewer's characteristics, the EPG being configured to automatically develop the query based on the viewer profile.

72. A viewer computing unit as recited in claim 70, further comprising:

a memory; and

the EPG being configured to log the viewer's viewing habits in the memory and to automatically develop the query based on the viewing habits.

73. A viewer computing unit as recited in claim 70, further comprising:

a memory; and

the EPG being configured to store the query in the memory within an organized, hierarchic structure.

74. For execution on a processor of a viewer computing unit, an electronic program guide (EPG) executing on the processor to organize programming information, the EPG being configured to enable multiple viewers to create queries for locating particular programming information, the EPG further creating a composite query that combines the queries of the viewers.

75. For execution on a processor of a viewer computing unit, the viewer computing unit having a display, an electronic program guide (EPG) executing on the processor to organize programming information, the EPG supporting a graphical user interface which can be shown on the display and being configured to periodically and automatically execute a query and to present on the user interface a notification when the query is successful.

76. An electronic programming guide as recited in claim 75, wherein while the display is showing a program, the EPG is configured to execute the query in background without interruption of the program.

77. For execution on a processor of a viewer computing unit, wherein the viewer computing unit has numbered keys which additionally correspond to one or more associated letters, each key generating key data when a viewer activates the key to request programming information, an electronic program guide (EPG) executing on the processor to organize programming information, the EPG being configured to interpret the key data as representing both a number associated with the key and one or more letters associated with the key, the EPG being further configured to determine possible programming information that the viewer is likely to be requesting based on different interpretations of the key data.

The Patent Office

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G4A (AUDB) H4F (FBB)

Int Cl (Ed.6): H04N (7/088) G06F (17/30)

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	EP0705036 A2	Sony. See the figures and column 3 lines 44-53.	1,4,6,9,70
X	EP0758833 A2	General Instrument Corporation of Delaware. See page 14 lines 2-5.	1,9,70
X,P	WO97/46011 A1	Sanyo. See the abstract.	1,9,70
X	WO97/02702 A2	Philips. See page 1 lines 17-23, page 2 lines 17-22, and page 17 lines 17-23.	1,4,6,8-10,70
X	WO94/14284 A1	Discovery Communications. See the figures, page 40 lines 6-10, page 51 lines 24-25, page 59 lines 11-23, page 60 lines 13-15, page 60 line 29 to page 61 line 2,page 66 lines 4-13, page 68 lines 5-12 and 22-25, page 70 lines 3-13 and page 78 lines 25-30.	1,2,4,5,6,9,70-72
X	US5606691	Harman Interactive. See column 4 lines 33-46 and column 2 lines 34-36.	1,4,6,8-10,70
X	US5223924	North American Philips. See column 4 line 59 to column 5 line 47.	1,2,9,70

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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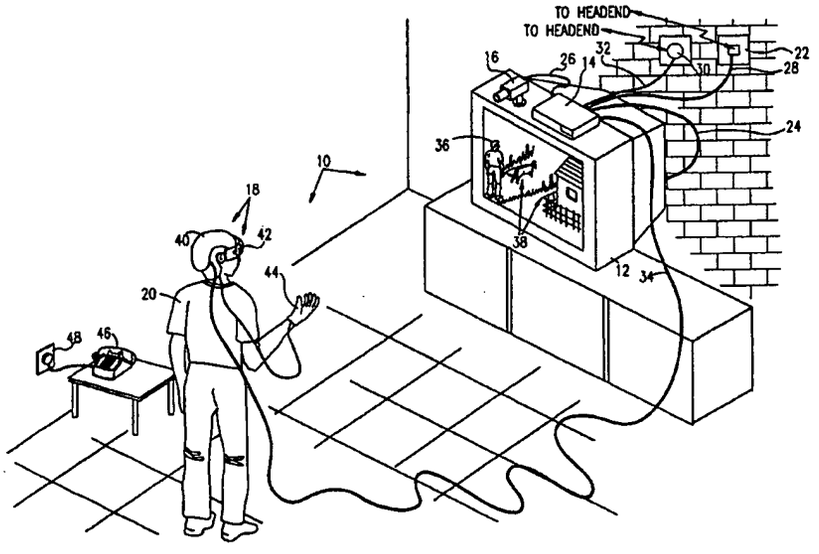

(57) Abstract

A gaming method (Figs. 6A–8) for an interactive game which is played at a player unit (10) having an interface device (14) which is coupled to a television (12) and to at least one communication network (Fig. 1). The method (Figs. 6A–8) includes displaying via the interface device (14), the interactive game on the television, capturing a picture of a player, transferring the picture of the player to a headend, processing the picture of the player to create an avatar of the player, electronically assimulating the avatar into the game, and enabling the player to interactively play the game by controlling the avatar via the at least one communication network.

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INTERACTIVE GAME SYSTEM

FIELD OF THE INVENTION

The present invention relates to interactive audio-visual productions generally and more particularly to interactive games and other diversions which are played via a communication network and with assistance of a television.

BACKGROUND OF THE INVENTION

There are known in the art several interactive games. One popular game show is based upon an animated character named "Hugo". The game show is broadcast to a plurality of viewers that view the game on television, and one of the viewers is selected to be a player.

The player controls "Hugo" via telephone by pressing keys "2", "4", "6" and "8" of a touch-tone telephone, so that "Hugo" is moved up when the key "2" is pressed, moved to the left when the key "4" is pressed, moved to the right when the key "6" is pressed, and moved down when the key "8" is pressed.

Generally, the player manipulates "Hugo" through a series of obstacles, and his success in manipulating "Hugo" is measured in comparison with other players that are selected during the show. A winner is declared as a player who was most successful in manipulating "Hugo".

Other games are also described in various US Patents.

US Patent 5,545,088 to Kravitz et al. describes a television game show which is interactively played by the studio participant game players, the television studio audience and by telephone with the television-viewing home audience.

US Patent 4,695,953 and the corresponding re-issue patent RE 33,662 describe TV animation interactively controlled by the viewer wherein the motion picture branching method is superseded by an animation method which enables rapid and repeated switching of multiple tracks of different camera-originated

animation of the same character during continuous action in a scene, and enables branching at the termination of an action to multiple actions or scenes.

US Patent 4,355,805 to Baer et al. describes apparatus and methods for use in conjunction with raster scan video displays, including standard monochrome and color television receivers, for the generation, display and manipulation of images upon the screen of a display for the purpose of playing games or for the purpose of drawing pictures.

US Patent 5,600,368 to Matthews, III describes an interactive television system that has a set-top box adapted for use with a television and a remote control handset. The set-top box is connected to receive a television broadcast that is filmed using multiple cameras situated at various camera viewpoints.

US Patent 5,035,422 to Berman and US Patent 5,108,115 to Berman et al. describe an interactive game show and method for achieving interactive communication therewith in which, by providing an interactive communication system whereby individuals are able to electronically select at least one possible outcome of a plurality of outcomes of a future event, individuals are able to participate in the outcome of that event and possible share in a prize award associated with the event.

US Patent 4,918,516 and the corresponding re-issue patent RE 34,340 describe a closed circuit interactive television system which provides a multichannel television signal from a localized headend which is used for individualized interactive selections by a plurality of users.

US Patent 5,462,275 to Lowe et al. describes a player interactive live action football game which may be played for example on a television screen.

US Patent 5,423,555 to Kidrin describes an interactive video game-television system wherein video game cartridge information is accessed in response to encoded signals transmitted with NTSC television signals.

US Patent 5,630,757 to Gagin et al. describes a complete multi-user game playing environment which provides game playing services to cable television subscribers over existing cable networks.

US Patent 5,190,285 to Levy et al. describes an electronic game with at least one, and preferably a plurality, of intelligent game pieces which each contain a re-programmable memory device.

US Patent 5,271,626 to Llenas et al. describes a television game for entertaining viewers and maintaining viewership during television programs and commercials.

US Patent 5,609,525 to Ohno et al. describes television or video game data reception apparatus which receives a data signal of television games transmitted from a base station in a wireless manner or through wire on a local station side so that the received data signal is used to play a game.

SUMMARY OF THE INVENTION

The present invention seeks to provide interactive games which are played via a communication network and with assistance of a television.

There is thus provided in accordance with a preferred embodiment of the present invention a gaming method for use with an interactive game which is played at a player unit having an interface device which is coupled to a television and to at least one communication network, the method including displaying, via the interface device, the interactive game on the television, capturing a picture of a player, transferring the picture of the player to a headend, processing the picture of the player to create an avatar of the player, electronically assimilating the avatar into the interactive game, and enabling the player to interactively play the interactive game by controlling the avatar via the at least one communication network.

Further in accordance with a preferred embodiment of the present invention the step of taking a picture of a player includes at least one of taking a video picture of the player and scanning an image of the player.

Still further in accordance with a preferred embodiment of the present invention the step of taking a picture of a player includes scanning a three-dimensional image of the player.

Additionally in accordance with a preferred embodiment of the present invention the processing step is performed in electronic processing equipment at the headend.

Moreover in accordance with a preferred embodiment of the present invention the step of transferring includes the step of transmitting the picture of the player via the at least one communication network.

Further in accordance with a preferred embodiment of the present invention the step of electronically assimilating the avatar in the interactive game includes inserting the avatar in a virtual studio environment.

Still further in accordance with a preferred embodiment of the present invention the method includes selecting, at the player unit, a basic avatar from a group of avatars, and confirming a selection of the basic avatar by transmitting an authorization signal.

Additionally in accordance with a preferred embodiment of the present invention the processing step includes combining, in response to acceptance of the authorization signal, the picture of the player with the basic avatar to create an avatar having combined characteristics of the player and of the basic avatar.

There is also provided in accordance with another preferred embodiment of the present invention a gaming method for use with an interactive game in which, at a first player unit, a first interface device is coupled to a first television and to a communication network, and at a second player unit, a second interface device is coupled to a second television and to the communication network, the method including displaying, via the first and second interface devices, the interactive game at the first and second televisions, and enabling a first player, playing at the first player unit, and a second player, playing at the second player unit, to play along with the interactive game by competing each against the other via the communication network.

There is also provided in accordance with another preferred embodiment of the present invention, for use with a system in which an interactive game is transmitted via a communication network to a multiplicity of viewer units, and in which each viewer unit includes an interface device and a television, and the interface device is coupled to the communication network, a gaming method for playing the interactive game at a player unit which is in two-way communication with a virtual reality kit activated by a player and including at least a two-way link with the player unit, and for viewing the game played by the player at the multiplicity of viewer units, the method including encoding, at a headend, a first version of the interactive game by employing a first gaming program code and transmitting the first version of the interactive game to the multiplicity of viewer

units, encoding, at the headend, a second version of the interactive game by employing a second gaming program code and transmitting the second version of the interactive game to the player unit, enabling the player to interactively play the interactive game, via the virtual reality kit, by performing actions in a virtual reality environment defined by the second version of the interactive game, detecting the actions of the player and obtaining a stream of detection signals therefrom, transmitting the detection signals to the headend via the communication network, processing, at the headend, the detection signals to implement the actions of the player in an avatar which simulates the player, and electronically inserting the avatar in the first version of the interactive game which is transmitted to the multiplicity of viewer units.

Further in accordance with a preferred embodiment of the present invention the step of processing includes transforming the actions of the player to actions of the avatar in a virtual studio environment.

Still further in accordance with a preferred embodiment of the present invention the method also includes selecting a basic avatar from a group of avatars, confirming a selection of the basic avatar by transmitting an authorization signal to the headend, accepting the authorization signal at the headend, and combining a picture of the player with the basic avatar to create an avatar having combined characteristics of the player and of the basic avatar.

There is also provided in accordance with another preferred embodiment of the present invention, for use with a system in which an interactive game is transmitted via a communication network to a multiplicity of viewer units, and in which each viewer unit includes an interface device and a television, and the interface device is coupled to the communication network, a gaming method for playing the interactive game at a player unit, and for viewing the game played by the player at the multiplicity of viewer units, the method including encoding, at a headend, a first version of the interactive game which includes a first environment by employing a first gaming program code, and transmitting the first version of the

interactive game to the multiplicity of viewer units, encoding, at the headend, a second version of the interactive game which includes a second environment by employing a second gaming program code, and transmitting the second version of the interactive game to the player unit, enabling the player to interactively play the interactive game in the second environment defined by the second version of the interactive game, and viewing, at the multiplicity of viewer units, the interactive game in the first environment defined by the first version of the interactive game.

Further in accordance with a preferred embodiment of the present invention the first environment includes an outer view environment of the game.

Still further in accordance with a preferred embodiment of the present invention the second environment includes an inner view environment of the game.

Additionally in accordance with a preferred embodiment of the present invention the first environment and the second environment include virtual studio environments.

Moreover in accordance with a preferred embodiment of the present invention the second version of the interactive game includes a pay program which is received over a separate data stream.

There is also provided in accordance with another preferred embodiment of the present invention a method of controlling a signal broadcast from a headend of a television system from a player unit operatively attached to the television broadcast system and being in two-way communication therewith, the method including broadcasting, from the headend, a perspective image of at least one three-dimensional character in an environment created by a virtual studio, transmitting, from the player unit, a control signal directed to the headend, modifying the perspective image of the at least one three-dimensional character at least partly in response to the control signal to produce a modified perspective image, and broadcasting the modified perspective image from the headend.

There is also provided in accordance with another preferred embodiment of the present invention a method for remotely customizing an avatar

for broadcast from a headend of a television broadcast system, the method including providing a picture of a user of the television broadcast system, selecting a basic avatar from a group of avatars, confirming selection of the basic avatar by transmitting an authorization signal to the headend, accepting the authorization signal at the headend, and combining the picture of the user with the basic avatar to create an avatar having combined characteristics of the player and of the basic avatar.

There is also provided in accordance with another preferred embodiment of the present invention a gaming method for use with an interactive game which is played via a communication network in a plurality of modes, the method including enabling a first player, playing at a first player unit, to interactively play the interactive game in a first mode by controlling an avatar via the communication network, transmitting the interactive game played in the first mode to a plurality of viewer units, and in response to transmission of an authorization signal, enabling a second player, playing at one of the plurality of viewer units, to view the interactive game played in the first mode by the first player and to play along with the interactive game in a second mode by competing against the first player.

Further in accordance with a preferred embodiment of the present invention the method includes the step of storing results of the interactive game played in the second mode at the one of the plurality of viewer units.

Still further in accordance with a preferred embodiment of the present invention the method includes transmitting the results of the interactive game played in the second mode via the communication network to a headend when at least one of the results exceeds a predetermined threshold value.

There is also provided in accordance with another preferred embodiment of the present invention a player unit which is operable to be placed in two-way communication with a headend and at which an interactive game is playable by a player via a television, the player unit including a camera which is

operative to take a picture of a player, and an interface device coupled to the camera, to the television, and to a communication network and operative to receive gaming inputs from the player and to transmit the gaming inputs and the picture of the player received from the camera to the headend via the communication network, wherein the gaming inputs include control signals operative to control operations of an avatar based on the picture of the player, and the avatar is electronically assimilated in the interactive game by a virtual studio.

There is also provided in accordance with another preferred embodiment of the present invention a gaming system including a headend which is coupled to a communication network, the headend including an encoder for encoding a first version of the interactive game by employing a first gaming program code to generate an encoded first version of the interactive game, and for encoding a second version of the interactive game by employing a second gaming program code to generate an encoded second version of the interactive game, a multiplexer for multiplexing the encoded first version of the interactive game and the encoded second version of the interactive game to produce a multiplexed signal, and a transmitter for transmitting the multiplexed signal to a plurality of viewers, a multiplicity of viewer units, each including a television and an interface device which is coupled to the communication network and is operative to receive, demultiplex and decode the first version of the interactive game by employing the first gaming program code, a player unit at which an interactive game is played by a player, the player unit including a player television, and a player interface device coupled to the player television, and to the communication network, wherein the player interface device is operative to receive, demultiplex and decode the second version of the interactive game by employing the second gaming program code, and a player interface kit which includes at least a two-way link with the player unit, and the player interface kit is operative to detect actions performed by the player, to obtain a stream of detection signals therefrom, and to transmit the stream of detection signals to the headend via the player interface device and the

communication network, and detection signals are employed at the headend to implement the actions of the player in an avatar which simulates the player, the avatar being electronically inserted in the first version of the interactive game which is transmitted to the multiplicity of viewer units.

Further in accordance with a preferred embodiment of the present invention the first version of the interactive game includes an outer view environment of the interactive game, and the second version of the interactive game includes an inner view environment of the interactive game.

There is also provided in accordance with another preferred embodiment of the present invention a gaming system including a headend which is coupled to a communication network, the headend including an encoder for encoding a first version of the interactive game which includes a first environment by employing a first gaming program code to generate an encoded first version of the game, and for encoding a second version of the interactive game which includes a second environment by employing a second gaming program code to generate an encoded second version of the game, a multiplexer for multiplexing the encoded first version of the interactive game and the encoded second version of the interactive game to produce a multiplexed signal, and a transmitter for transmitting the multiplexed signal to a plurality of viewers, a multiplicity of viewer units, each including a television and an interface device which is coupled to the communication network and is operative to receive, demultiplex and decode the first version of the interactive game by employing the first gaming program code, and to enable a viewer to view the interactive game in the first environment defined by the first version of the interactive game, and a player unit at which an interactive game is played by a player, the player unit including a player television, and a player interface device coupled to the player television, and to the communication network, wherein the player interface device is operative to receive, demultiplex and decode the second version of the interactive game by employing the second gaming program code, and to enable the player to interactively play the interactive

game in the second environment defined by the second version of the interactive game.

Further in accordance with a preferred embodiment of the present invention the first version of the interactive game and the second version of the interactive game are transmitted on separate data streams.

Still further in accordance with a preferred embodiment of the present invention the second version of the interactive game is a pay program which is received over a separate data stream.

Additionally in accordance with a preferred embodiment of the present invention the first environment includes an outer view environment of the game and the second environment includes an inner view environment of the game.

Moreover in accordance with a preferred embodiment of the present invention the first environment and the second environment are virtual studio environments.

Further in accordance with a preferred embodiment of the present invention the player interface kit includes a virtual reality kit.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified pictorial illustration of a player unit in an interactive game system constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 2 is a block diagram illustration of a preferred implementation of a set-top box which forms part of the player unit of Fig. 1;

Fig. 3 is a block diagram illustration of a headend in an interactive game system constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 4 is a simplified pictorial illustration of systems participating in creation of an avatar having combined characteristics of a player and of a basic avatar, and of the creation of the avatar;

Fig. 5 is a block diagram illustration of a transmitting assembly which forms part of the headend of Fig. 3 and is constructed and operative in accordance with a preferred embodiment of the present invention;

Figs. 6A and 6B together constitute a flow chart illustrating a preferred gaming method for use with an interactive game which is operative in accordance with a preferred embodiment of the present invention;

Fig. 7 is a flow chart illustrating a preferred play along method which is associated with the gaming method described in Figs. 6A and 6B; and

Fig. 8 is a flow chart illustrating another preferred play along method which is associated with the gaming method described in Figs. 6A and 6B.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1, which is a simplified pictorial illustration of a player unit 10 in an interactive game system constructed and operative in accordance with a preferred embodiment of the present invention.

The player unit 10 of Fig. 1 preferably includes a television 12, an interface device such as a set-top box (STB) 14, as is well known in the art, a video camera 16 and a virtual reality kit 18 which is worn and activated by a player 20. It is appreciated that, alternatively to the virtual reality kit 18, any other appropriate user interface kit, such as a joy stick or a telephone keypad input device, may be used. Without limiting the generality of the meaning of the term "user interface kit", the virtual reality kit 18 is believed to be preferable, and is generally described herein.

Preferably, the STB 14 is coupled to the television 12, to the video camera 16 and to a radio-frequency (RF) wall outlet 22 via coaxial cables 24, 26 and 28 respectively. The STB 14 is also preferably coupled to a telephone wall outlet 30 via a twisted pair 32. Preferably, the wall outlet 22 is in turn connected to a television network (not shown), and the telephone wall outlet 30 is connected to a telephone network (not shown).

In a preferred embodiment of the present invention the virtual reality kit 18, which is activated by the player 20, is coupled to the STB 14 via cable 34. Preferably, operations performed by the player 20 are sensed by conventional detectors (not shown) in the virtual reality kit 18 and transferred, via cable 34, to the STB 14. Alternatively to the cable 34, an appropriate wireless interface, such as an infrared wireless interface, may be used, and is typically preferred.

In a preferred embodiment of the present invention the player 20 is an interactive player in an interactive game show which is broadcast to a plurality of viewers, including the player 20. Preferably, the interactive player 20 interactively controls an avatar 36 which is displayed on the television 12 by activating various

functions in the virtual reality kit 18. The avatar 36 is preferably a three-dimensional avatar which is navigated and controlled by the player 20 through a changing three-dimensional gaming environment 38 which is displayed on the television and forms part of the interactive game show.

Preferably, the virtual reality kit 18 is a conventional virtual reality kit which may include units such as a helmet 40 with a display 42 which typically provides a simulated three-dimensional view as is well-known in the art, a microphone and sensors (not shown) and a glove 44 with sensors (not shown). When the player 20, that wears the helmet 40 and the glove 44, makes a movement by moving a hand on which he wears the glove 42, or by moving his head, the movement is sensed by the corresponding sensors which generate a detection signal in response to the movement.

It is appreciated that the display 42 may be excluded, and the player may view the game on the television 12 rather than on the display 42, and may respond to challenges displayed on the television 12 by moving the hand or the head. Alternatively, in a case where the display 42 is provided, the display on the television 12 may be ignored.

The detection signal is preferably transmitted via the cable 34 to the STB 14, and from the STB 14 to a headend, described hereinafter with reference to Fig. 3, via the telephone network or via the television network and is employed to control the avatar 36 through the gaming environment 38. Alternatively to the telephone network or the television network, any other appropriate telecommunications network, such as, for example, the Internet or a satellite-based communications network, may be used.

In another preferred embodiment of the present invention the virtual reality kit 18 may be excluded and the player 20 may control the avatar 36 by operating keys of a touch-tone telephone 46 which is coupled to the telephone wall outlet 30 or to an additional telephone wall outlet 48.

It is appreciated that the telephone network and the television network may be replaced by any other conventional two-way communication network. For the purposes of the present specification, the term "two-way communication network" is used in a broad sense to include any form of two-way wired and wireless RF networks, such as a two-way television network, a two-way cable television network and a two-way satellite communication network, as well as two-way wired and wireless telephone networks and two-way wired and wireless optical networks, such as a fiber-optic network, and a wireless infrared optical communication network.

Additionally, the term "two-way communication network" also includes any form of hybrid communication networks such as a one-way television network and a two-way telephone network as applied in conventional state-of-the-art pay television systems.

It is appreciated that the definition of "two-way communication network" provided above also includes a very wide variety of communication systems including, for example, the Internet, other networks using Internet protocols, local area networks (LANs), wide area networks (WANs), and personal area networks (PANs).

Reference is now made to Fig. 2 which is a block diagram illustration of a preferred implementation of the STB 14 which forms part of the player unit of Fig. 1.

Preferably, STB 14 includes a processor 100, a memory 102, a telephone modem 104, an encryptor/decrypter 106, a keyboard 108, a transmitter 110, a television receiver and tuner 112, and a compressor/decompressor unit 114. The processor 100 preferably receives inputs and selections from virtual reality kit 18, from keyboard unit 108 and from the telephone network via the modem 104. In a preferred embodiment of the present invention the processor 100 may also receive inputs and selections from a remote control 116, which are shown as transmitted

via the keyboard unit 108 but which may alternatively be transmitted via another interface unit (not shown).

Preferably, the processor 100 communicates in two-way communication with the memory 102, with the compressor/decompressor unit 114 and with the encryptor/decrypter 106. It is appreciated that the compressor/decompressor unit 114 may compress/decompress information provided from and to the processor 100 as the case may be, and the encryptor/decrypter 106 may encrypt/decrypt information provided from and to the processor 100 as the case may be.

In a preferred embodiment of the present invention the processor 100 provides information generated thereat to the transmitter 110 for transmission over the television network or over the telephone network. The transmitter 110 may also receive video information from the video camera 16 of Fig. 1 and transmit the video information via the television network or the telephone network.

Preferably, the television receiver and tuner 112 is operative to provide conventional receiving, demultiplexing and tuning of television transmissions received from the television network. It is appreciated that in state-of-the-art television systems, the television transmissions comprise digitally compressed and encrypted television transmissions. Accordingly, the television receiver and tuner 112 may be a conventional integrated receiver and decoder (IRD) which receives, demultiplexes and decodes the television transmissions, and the compressor/decompressor unit 114 and the encryptor/decrypter 106 may be employed to decompress the transmissions and to decrypt the transmissions respectively. It is appreciated that many IRDs already include the decompression and the decryption functions.

It is further appreciated that if another communication network is employed, as mentioned above, all the transmission and reception functions may be performed via the communication network.

Reference is now made to Fig. 3 which is a block diagram illustration of a headend 200 in an interactive game system constructed and operative in accordance with a preferred embodiment of the present invention.

Preferably, the headend 200 communicates with a multiplicity of viewer units via the television network and via the telephone network which are mentioned above with reference to Figs. 1 and 2. If the television network comprises a two-way television network, the headend 200 may transmit and receive information over the television network. If the television network comprises a one-way television network, the headend may transmit information over the television network, and receive and transmit information over the telephone network. As mentioned above, other communication networks may be employed, as long as they support two-way communication.

The headend 200 may preferably include a receiver 202 and a transmitting assembly 204 for respectively receiving and transmitting gaming inputs and control information over the communication network. If a hybrid television and telephone network is employed, as illustrated in Fig. 3, the receiver 202 may receive the gaming inputs and the control information over the telephone network and the transmitting assembly 204 may transmit information over the television network as well as over the telephone network.

In a preferred embodiment of the present invention the headend 200 also includes electronic processing equipment 206 which is coupled to the receiver 202 and to the transmitting assembly 204. Preferably, the electronic processing equipment 206 is also coupled to a virtual studio assembly 208 which may form part of the headend 200 or may be coupled thereto.

The virtual studio assembly 208 is preferably a conventional virtual studio assembly which is typically employed to provide virtual and graphical environments in programs which incorporate live actors, and in animated programs or programs which combine animated environments and animated characters with live actors. Virtual studio services have been applied, for example, in the 1996

election coverage in Israel to provide graphical interpretation of expected seats in Parliament assigned to various political parties, and similarly in coverage of the 1996 federal elections in the United States. Typical virtual studio systems and systems for use therewith are commercially available from Dream Team Ltd., 3 Maskit Street, Herzliya Pituach, Israel and from RT.SET and ORAD, also of Israel.

In a preferred embodiment of the present invention the virtual studio assembly 208 is coupled to a studio television camera 210 which is operative to provide a video movie picture which includes an interactive game show that combines animated environments and animated characters generated at the virtual studio assembly 208 with live actors. It is appreciated that the studio television camera 210 may be part of the virtual studio assembly 208 and may supply video images thereto which are processed by the virtual studio assembly 208 and typically combined with other images, including, for example, computer-generated graphic and/or animated images.

Preferably, the interactive game show which is generated in the way described above is provide to the transmitting assembly 204, and is transmitted by the transmitting assembly 204 to a multiplicity of viewer units (not shown) via the communication network.

In a preferred embodiment of the present invention, the information received at the headend 200 is provided by the multiplicity of viewer units, and part of the information may include pictures of players and selections of animated characters from a group of basic animated characters which may be employed as basic avatars in interactive games. The term "avatar" as used throughout the present specification refers to an embodiment or personification, typically a video embodiment or personification, of a person which is typically combined with other video images in a virtual studio, as described above, to produce a combined representation in which the avatar represents the person. Typically, but not necessarily, an avatar associated with a person embodies or personifies some physical or personality characteristics of the person, possibly in caricatured form.

Preferably, a player is selected to be an interactive player who interactively participates in the interactive game show. The player may preferably be selected by an audience that views the game show, by a manager of the game show, or automatically based on a predetermined criterion, such as previous game playing history of the viewer who wishes to be a player.

In a preferred embodiment of the present invention the selected player is invited to participate in the game show. If the player agrees, he is requested to send a picture of himself, or a picture of another person, to the headend via the communication network, and to select a basic avatar from the group of basic avatars to which his picture is adapted.

Preferably, in order for the selected player to be able to participate in the game, the player must make a payment by transmitting a payment authorization signal associated with a selection of a basic avatar. Once the payment authorization signal is received and processed in a billing system (not shown) at the headend 200, the player is authorized to interactively play the game.

It is appreciated that transmission of the pictures of the players may be unrelated in time and in means of communication to the game show, and may be transmitted at any appropriate time, such as at a time when the game show is not played and via other communication networks, such as via the Internet. Thus, a bank of pictures of players may be established at the headend 200, and a player may be selected by selecting from among those having a picture in the bank of players.

In a preferred embodiment of the present invention, the picture of the selected player is provided to the electronic processing equipment 206 and is processed thereat. Then, a processed picture of the player is provided to the virtual studio assembly 208 which adapts the picture of the player to the basic avatar selected from the group of basic avatars, and combines the picture of the player with the basic avatar to create an avatar having combined characteristics of the player and of the basic avatar. Typically, the avatar having combined

characteristics of the player and of the basic avatar includes a body of the basic avatar and the head of the player as extracted from the picture of the player, and this combination may be preferred.

Preferably, the avatar having combined characteristics of the player and of the basic avatar is inserted in the game which is transmitted, by the transmitting assembly 204, to the multiplicity of viewer units so that any viewer that views the interactive game show sees the game as played by the selected player, and the avatar having combined characteristics of the player and of the basic avatar.

In another preferred embodiment of the present invention each viewer whose picture is transmitted to the headend 200 may view the game show with an avatar having the face of that viewer combined thereto. The combination of the face of the viewer with the avatar is made as described above for the selected viewer avatar, and the transmitting assembly 204 at the headend may transmit a corresponding avatar to each viewer. It is appreciated that, alternatively, the combination of the face of the viewer with the avatar may be made in the set top box 14, in which case it would be possible for different viewers other than the play to each combine their face with the player's avatar.

In yet another preferred embodiment of the present invention each viewer may store a preferred combination of an avatar having the face of the viewer combined thereto in a memory at a viewer unit set-top box, such as memory 102 of Fig. 2.

It is appreciated that each picture of each viewer and the picture of the player may be taken by a video camera, such as video camera 16 of Fig. 1. Alternatively or additionally, each picture may be taken by a scanner (not shown), such as a conventional three-dimensional scanner, in which case the picture may comprise a three-dimensional digital representation. In another preferred embodiment of the present invention, each picture may be enhanced by a scanner having image processing capabilities.

Reference is now made to Fig. 4 which is a simplified pictorial illustration of a preferred embodiment of systems participating in creation of an avatar having combined characteristics of a player and of a selected basic avatar, and of the creation of the avatar.

Preferably, the video camera 16 takes a picture of a player. The picture of the player typically includes at least the face of the player as shown in illustrative form in Fig. 4 above the camera 16.

The picture of the player is preferably transmitted to the headend 200 via the STB 14. At the headend 200, the picture is received at receiver 202 of Fig. 3 and provided to the electronic processing equipment 206 of Fig. 3.

At the electronic processing equipment 206, the picture of the player is captured and an image of the face of the player is separated from the rest of the picture as shown in illustrative form above the electronic processing equipment 206. Then, the image of the face of the player is communicated to the virtual studio assembly 208 at which a basic avatar, such as a rabbit, is created as shown in illustrative form above the virtual studio assembly 208.

Preferably, at the virtual studio assembly 208, or at the electronic processing equipment 206, the face of the player is combined with the chosen basic avatar, e.g. the rabbit, to provide the avatar having combined characteristics of the player and of the basic avatar as mentioned above with reference to Fig. 3, the basic avatar being electronically assimilated in the interactive game and transmitted via the transmitting assembly 204 to the multiplicity of viewer units. The avatar having combined characteristics of the player and of the basic avatar is shown in illustrative form above the transmitting assembly 204.

It is appreciated that if the electronic processing equipment 206 is embedded in the virtual studio 208, all the processing that is mentioned above is performed in the virtual studio assembly 208.

Reference is now made to Fig. 5 which is a block diagram illustration of the transmitting assembly 204 which forms part of the headend 200 of Fig. 3.

In a preferred embodiment of the present invention the transmitting assembly 204 includes an encoder 300 which is operative to encode a first version of the interactive game by employing a first gaming program code, and to encode a second version of the interactive game by employing a second gaming program code.

Preferably, the encoder 300 is coupled to a multiplexer (MUX) 302 which is operative to multiplex an encoded first version of the interactive game and an encoded second version of the interactive game so as to produce a multiplexed signal. The multiplexed signal is provided to a transmitter 304 which is operative to transmit the multiplexed signal to a plurality of viewers.

Typically, the multiplexer 302 may be combined with the encoder 300 in an MPEG unit, as is well known in the art, which typically combines multiplexing and compression with other features appropriate to digital video transmission. Operation of typical commercially-available MPEG units is generally described in published standards such as the ISO/IEC 13818-6 International Standard entitled "Coding of Moving Pictures and Associated Audio."

It is appreciated that if the signal transmissions are in digital form, the encoder 300 may include a digital encoder, the multiplexer 302 may include a digital multiplexer and the transmitter 304 may include a digital transmitter. Preferably, the encoder 300 may encode other television programs as well as the first and second versions of the game show, and the multiplexer 302 may multiplex encoded television programs as well as the encoded first and second versions of the interactive game.

In a preferred embodiment of the present invention the first version of the interactive game may include a version of the game that is transmitted to all viewers that do not participate as interactive players in the game. Preferably, the second version of the interactive game may include a version of the game which is transmitted only to the player or players who is or are selected to interactively play the game as mentioned above. It is appreciated that the first version of the game

may be different from the second version of the game. A preferred embodiment of first and second versions of the interactive game, and the differences between them are described below with reference to Figs. 6A and 6B.

Reference is now made to Figs. 6A and 6B which together constitute a flow chart illustrating a preferred gaming method for use with an interactive game show which is played by employing the apparatus and systems Figs. 1 - 5.

In a preferred embodiment of the present invention the interactive game show is displayed on the television 12 at the player unit 10 of Fig. 1. At any time prior to the show, or during the show, a viewer may be selected to be an interactive player in the game. Preferably, the selection of the viewer as a player may be performed by placing a telephone call to the viewer's residence an informing him of the selection, or by transmitting a selection message which is individually addressed to the viewer.

Once the player is selected, and upon his acceptance to participate in the game which may be confirmed by transmitting a payment authorization signal to the headend, the player may preferably be requested to send an electronic image of his face to the headend 200 at which the game is managed. Then, the player may preferably operate video camera 16 to photograph himself. Alternatively, the player may use a conventional scanner, or a conventional three-dimensional scanner, to generate a scanned image of his face.

In a preferred embodiment of the present invention the picture of the player may be transferred to the headend 200, either by mail or by transmitting the image of the player via a communication network to which the headend 200 is coupled, such as a television network or the Internet.

Preferably, the picture of the player is processed at the electronic processing equipment 206 at the headend 200 to create an avatar of the player. It is appreciated that the avatar may include a combination of the face of the player with a body of the basic avatar, or a combination of a face of the basic avatar with the

body of the player, and thus the avatar includes combined characteristics of the player and of the basic avatar.

Preferably, the avatar of the player is electronically assimilated into the interactive game, and the player is enabled, upon initialization of the game, to interactively play the interactive game by controlling the avatar via the communication network. It is appreciated that assimilation of the avatar may include inserting the avatar in a virtual studio environment.

If the player uses a virtual reality kit to play the game, such as the virtual reality kit 18 of Fig. 1, the player plays the game in a realistic environment, typically an environment as viewed by him when he is "implanted" as an avatar in the game. For the purposes of the present invention the term "inner view" is used to include such a view of the game as seen by the player when he forms part of the game from the view of the player's avatar.

It is appreciated that viewers that do not play the game, but rather just watch it played by the player, are generally not interested in viewing the game from the inner view of the player. Typically, such viewers, may see the environment of the game from an "outer view". The term "outer view" is used in the present specification to include a view of an outside viewer that watches the player as well as the environment in which the player acts.

In a preferred embodiment of the present invention a first version of the interactive game is encoded at the headend 200 by employing a first gaming program code. The term "gaming program code" is used throughout the present specification to refer to a code or any other appropriate method used to assign one or more destinations to a version associated with the code. The first version of the game preferably includes an outer view environment of the game, and this version is transmitted to a multiplicity of viewer units.

Preferably, a second version of the interactive game is also encoded at the headend. The second version of the game preferably includes an inner view environment of the game, and this version is transmitted to the player unit only. It is

appreciated that the second version of the game is encoded by employing a second gaming program code which differs from the first gaming program code. In a preferred embodiment of the present invention the inner view environment of the game and the outer view environment of the game are virtual studio environments.

In a preferred embodiment of the present invention the player is enabled to interactively play the interactive game, via the virtual reality kit 18, by performing actions in a virtual reality environment defined by the second version of the interactive game. Preferably, the actions of the player are detected by the virtual reality kit 18 and a stream of detection signals is obtained therefrom.

The detection signals are transmitted to the headend 200 via the communication network. At the headend 200, the detection signals are processed to implement the actions of the player in an avatar which simulates the player. Preferably, the avatar is electronically inserted in the first version of the interactive game which is transmitted to the multiplicity of viewer units. It is appreciated that the processing of the detection signals may include transforming the actions of the player to actions of the avatar in a virtual studio environment. It is further appreciated that the second version might alternatively be provided to viewers in addition to the player, typically for a fee.

As mentioned before with reference to other preferred embodiments of the present invention, the avatar may include an avatar having combined characteristics of the player of a basic avatar.

It is appreciated that the first and second versions of the game which provide separate views of the game may be used in a configuration which does not employ the virtual reality kit 18. In such a case, the player may manipulate keys of an input device, for example, a touch-tone telephone or a joy-stick (not shown), to interactively play the interactive game while viewing a second environment defined by the second version of the interactive game, i.e. the environment seen from the inner view. Preferably, other viewers may watch the interactive game while viewing a first environment defined by the first version of the interactive game, i.e.

the environment seen from the outer view. Preferably, the first environment and the second environment may be virtual studio environments.

In a preferred embodiment of the present invention, the interactive game which is played by the player, i.e. the second version of the game, may be defined as a pay program. In such a case, the pay program may occupy a separate data stream, if the pay program is transmitted in a digital form, or a separate pay television channel if the pay program is transmitted in an analog form. It is further appreciated that the data stream may be dynamic and may vary in accordance with bandwidth allocations, as is well known in the art, particularly in relation to MPEG, as referred to above.

It is appreciated that the playing methods of the present invention enable controlling a signal broadcasted from a headend of a television system from a player unit operatively attached to the television broadcast system and being in two-way communication therewith. In a preferred embodiment of the present invention, a perspective image of at least one three-dimensional character in an environment created by a virtual studio is broadcast from the headend.

Preferably, a control signal which is directed to the headend is transmitted from the player unit. The control signal is employed to modify the perspective image of the at least one three-dimensional character so as to produce a modified perspective image which is further broadcasted from the headend.

In a preferred embodiment of the present invention the signal broadcasted from a headend may include an avatar which may be remotely customized for broadcast from a headend of a television broadcast system. Preferably, in order to customize the avatar, a picture of a user of the television broadcast system is provided and a basic avatar is selected from a group of avatars. When a selection of the basic avatar is confirmed by transmitting a payment authorization signal to the headend, and the payment authorization signal is accepted at the headend, the picture of the user is combined with the basic avatar to

create an avatar having combined characteristics of the player and of the basic avatar.

In another preferred embodiment of the present invention a viewer that was not selected to be an interactive player in the game may still play the game in various play along modes which are described herein with reference to Figs. 7 and 8.

Reference is now made to Fig. 7 which is a flow chart illustrating a preferred play along method which is associated with the gaming method described in Fig. 6.

Preferably, a first player and a second player, which are not selected to be interactive players in the game, may view the game show on a first and a second television at respective player units and may decide to compete each against the other.

In such a case, the first player may dial a code number of the second player on a telephone, or enter an identification code of the second player via a remote control, such as remote control 116 of Fig. 2.

Preferably, the code number, or the identification code, is transmitted to the headend 200 via an STB, such as STB 14 of Fig. 1, and via a communication network, such as the communication network mentioned above with reference to Figs. 2 and 3.

At the headend 200, the code number or the identification code is checked against a list of viewers, and if a match is found with a code of a viewer, which in this case is the code of the second player, the headend 200 establishes a communication link between the first player and the second player, and enables the first player, playing at the first player unit, and the second player, playing at the second player unit, to play along the interactive game by competing each against the other via the communication network.

In a preferred embodiment of the present invention the first player and the second player may be each requested, by the headend 200, to transmit to

the headend 200 a payment authorization signal representing a charge to be paid by each player for participating in the play along mode of the game.

Reference is now made to Fig. 8 which is a flow chart illustrating another preferred play along method which is associated with the gaming method described in Fig. 6.

Preferably, a first player is selected to be an interactive player which is enabled to play the interactive game at a first player unit in a first mode by controlling an avatar via a communication network, such as the communication network mentioned above with reference to Figs. 2 and 3.

In a preferred embodiment of the present invention the interactive game played in the first mode is transmitted to a plurality of viewer units. Preferably, a second player is enabled, in response to transmission of a payment authorization signal, to view the interactive game played in the first mode by the first player and to play along the interactive game in a second mode by competing against the first player.

It is appreciated that the game played in the second mode is typically played at a second player unit and is not transmitted to the plurality of viewer units. Rather, the results of the game played in the second mode may be stored in a memory at the second player unit, such as the memory 102 of Fig. 2. The results may be transmitted to the headend 200, typically at hours of non-peak usage of the communication network, via the communication network when at least one of the results exceeds a predetermined threshold value which reflects a certain amount of success in competing against the first player.

At the headend 200, the results may be compared with results of other players that are playing along, and may be employed to assist in further selections of interactive players which play in the first mode.

It is appreciated that various features of the invention which are, for clarity, described in the contexts of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention

which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined by the claims that follow:

What is claimed is:

CLAIMS

1. A gaming method for use with an interactive game which is played at a player unit having an interface device which is coupled to a television and to at least one communication network, the method comprising:

displaying, via the interface device, the interactive game on the television;

capturing a picture of a player;

transferring the picture of the player to a headend;

processing the picture of the player to create an avatar of the player;

electronically assimilating the avatar into the interactive game; and

enabling the player to interactively play the interactive game by controlling the avatar via said at least one communication network.

2. A method according to claim 1 and wherein said step of taking a picture of a player comprises at least one of taking a video picture of the player and scanning an image of the player.

3. A method according to claim 1 and wherein said step of taking a picture of a player comprises scanning a three-dimensional image of the player.

4. A method according to any of claims 1 - 3 and wherein said processing step is performed in electronic processing equipment at the headend.

5. A method according to any of claims 1 - 4 and wherein said step of transferring includes the step of transmitting the picture of the player via said at least one communication network.

6. A method according to any of claims 1 - 5 and wherein said step of electronically assimilating the avatar in the interactive game includes inserting the avatar in a virtual studio environment.

7. A method according to any of claims 1 - 6 and comprising:

selecting, at the player unit, a basic avatar from a group of avatars; and

confirming a selection of the basic avatar by transmitting an authorization signal.

8. A method according to claim 7 and wherein said processing step comprises combining, in response to acceptance of the authorization signal, the picture of the player with the basic avatar to create an avatar having combined characteristics of the player and of the basic avatar.

9. A gaming method for use with an interactive game in which, at a first player unit, a first interface device is coupled to a first television and to a communication network, and at a second player unit, a second interface device is coupled to a second television and to the communication network, the method comprising:

displaying, via the first and second interface devices, the interactive game at the first and second televisions; and

enabling a first player, playing at the first player unit, and a second player, playing at the second player unit, to play along with the interactive game by competing each against the other via the communication network.

10. For use with a system in which an interactive game is transmitted via a communication network to a multiplicity of viewer units, and in which each viewer unit includes an interface device and a television, and the interface device is

coupled to the communication network, a gaming method for playing the interactive game at a player unit which is in two-way communication with a virtual reality kit activated by a player and including at least a two-way link with the player unit, and for viewing the game played by the player at the multiplicity of viewer units, the method comprising:

encoding, at a headend, a first version of the interactive game by employing a first gaming program code and transmitting the first version of the interactive game to the multiplicity of viewer units;

encoding, at the headend, a second version of the interactive game by employing a second gaming program code and transmitting the second version of the interactive game to the player unit;

enabling the player to interactively play the interactive game, via the virtual reality kit, by performing actions in a virtual reality environment defined by the second version of the interactive game;

detecting the actions of the player and obtaining a stream of detection signals therefrom;

transmitting the detection signals to the headend via the communication network;

processing, at the headend, the detection signals to implement the actions of the player in an avatar which simulates the player; and

electronically inserting the avatar in the first version of the interactive game which is transmitted to the multiplicity of viewer units.

11. A method according to claim 10 and wherein said step of processing comprises transforming the actions of the player to actions of the avatar in a virtual studio environment.

12. A method according to either of claim 10 or claim 11 and also comprising:

selecting a basic avatar from a group of avatars;

confirming a selection of the basic avatar by transmitting an authorization signal to the headend;

accepting the authorization signal at the headend; and

combining a picture of the player with the basic avatar to create an avatar having combined characteristics of the player and of the basic avatar.

13. For use with a system in which an interactive game is transmitted via a communication network to a multiplicity of viewer units, and in which each viewer unit includes an interface device and a television, and the interface device is coupled to the communication network, a gaming method for playing the interactive game at a player unit, and for viewing the game played by the player at the multiplicity of viewer units, the method comprising:

encoding, at a headend, a first version of the interactive game which includes a first environment by employing a first gaming program code, and transmitting the first version of the interactive game to the multiplicity of viewer units;

encoding, at the headend, a second version of the interactive game which includes a second environment by employing a second gaming program code, and transmitting the second version of the interactive game to the player unit;

enabling the player to interactively play the interactive game in the second environment defined by the second version of the interactive game; and

viewing, at the multiplicity of viewer units, the interactive game in the first environment defined by the first version of the interactive game.

14. A method according to claim 13 and wherein said first environment comprises an outer view environment of the game.

15. A method according to either of claim 13 or claim 14 and wherein said second environment comprises an inner view environment of the game.

16. A method according to claim 13 and wherein said first environment and said second environment comprise virtual studio environments.

17. A method according to claim 13 and wherein the second version of the interactive game comprises a pay program which is received over a separate data stream.

18. A method of controlling a signal broadcast from a headend of a television system from a player unit operatively attached to the television broadcast system and being in two-way communication therewith, the method comprising:

broadcasting, from the headend, a perspective image of at least one three-dimensional character in an environment created by a virtual studio;

transmitting, from the player unit, a control signal directed to the headend;

modifying the perspective image of the at least one three-dimensional character at least partly in response to the control signal to produce a modified perspective image; and

broadcasting the modified perspective image from the headend.

19. A method for remotely customizing an avatar for broadcast from a headend of a television broadcast system, the method comprising:

providing a picture of a user of the television broadcast system;

selecting a basic avatar from a group of avatars;

confirming selection of the basic avatar by transmitting an authorization signal to the headend;

accepting the authorization signal at the headend; and

combining the picture of the user with the basic avatar to create an avatar having combined characteristics of the player and of the basic avatar.

20. A gaming method for use with an interactive game which is played via a communication network in a plurality of modes, the method comprising:

enabling a first player, playing at a first player unit, to interactively play the interactive game in a first mode by controlling an avatar via said communication network;

transmitting the interactive game played in the first mode to a plurality of viewer units; and

in response to transmission of an authorization signal, enabling a second player, playing at one of the plurality of viewer units, to view the interactive game played in the first mode by the first player and to play along with the interactive game in a second mode by competing against the first player.

21. A method according to claim 20 and comprising the step of storing results of the interactive game played in the second mode at said one of the plurality of viewer units.

22. A method according to claim 21 and comprising transmitting said results of the interactive game played in the second mode via said communication network to a headend when at least one of said results exceeds a predetermined threshold value.

23. A player unit which is operable to be placed in two-way communication with a headend and at which an interactive game is playable by a player via a television, the player unit comprising:

a camera which is operative to take a picture of a player; and

an interface device coupled to the camera, to the television, and to a communication network and operative to receive gaming inputs from the player and to transmit the gaming inputs and the picture of the player received from the camera to the headend via said communication network, wherein

the gaming inputs comprise control signals operative to control operations of an avatar based on the picture of the player, and wherein

the avatar is electronically assimilated in the interactive game by a virtual studio.

24. A gaming system comprising:

a headend which is coupled to a communication network, the headend including:

an encoder for encoding a first version of the interactive game by employing a first gaming program code to generate an encoded first version of the interactive game, and for encoding a second version of the interactive game by employing a second gaming program code to generate an encoded second version of the interactive game;

a multiplexer for multiplexing the encoded first version of the interactive game and the encoded second version of the interactive game to produce a multiplexed signal; and

a transmitter for transmitting the multiplexed signal to a plurality of viewers;

a multiplicity of viewer units, each including a television and an interface device which is coupled to the communication network and is operative to receive, demultiplex and decode the first version of the interactive game by employing the first gaming program code;

a player unit at which an interactive game is played by a player, the player unit including a player television, and a player interface device coupled to the player television, and to said communication network, wherein the player

interface device is operative to receive, demultiplex and decode the second version of the interactive game by employing the second gaming program code; and

a player interface kit which includes at least a two-way link with the player unit, wherein

the player interface kit is operative to detect actions performed by the player, to obtain a stream of detection signals therefrom, and to transmit the stream of detection signals to the headend via the player interface device and the communication network, and wherein

the detection signals are employed at the headend to implement the actions of the player in an avatar which simulates the player, the avatar being electronically inserted in the first version of the interactive game which is transmitted to said multiplicity of viewer units.

25. A gaming system according to claim 24 and wherein said first version of the interactive game comprises an outer view environment of the interactive game, and said second version of the interactive game comprises an inner view environment of the interactive game.

26. A gaming system comprising:

a headend which is coupled to a communication network, the headend including:

an encoder for encoding a first version of the interactive game which includes a first environment by employing a first gaming program code to generate an encoded first version of the game, and for encoding a second version of the interactive game which includes a second environment by employing a second gaming program code to generate an encoded second version of the game;

a multiplexer for multiplexing the encoded first version of the interactive game and the encoded second version of the interactive game to produce a multiplexed signal; and

a transmitter for transmitting the multiplexed signal to a plurality of viewers;

a multiplicity of viewer units, each including a television and an interface device which is coupled to the communication network and is operative to receive, demultiplex and decode the first version of the interactive game by employing the first gaming program code, and to enable a viewer to view the interactive game in the first environment defined by the first version of the interactive game; and

a player unit at which an interactive game is played by a player, the player unit including a player television, and a player interface device coupled to the player television, and to said communication network, wherein the player interface device is operative to receive, demultiplex and decode the second version of the interactive game by employing the second gaming program code, and to enable the player to interactively play the interactive game in the second environment defined by the second version of the interactive game.

27. A system according to claim 26 and wherein said first version of the interactive game and said second version of the interactive game are transmitted on separate data streams.

28. A system according to claim 27 and wherein the second version of the interactive game is a pay program which is received over a separate data stream.

29. A system according to claim 26 and wherein said first environment comprises an outer view environment of the game and said second environment comprises an inner view environment of the game.

30. A system according to claim 26 and wherein said first environment and said second environment are virtual studio environments.

31. A system according to claim 24 and wherein the player interface kit comprises a virtual reality kit.

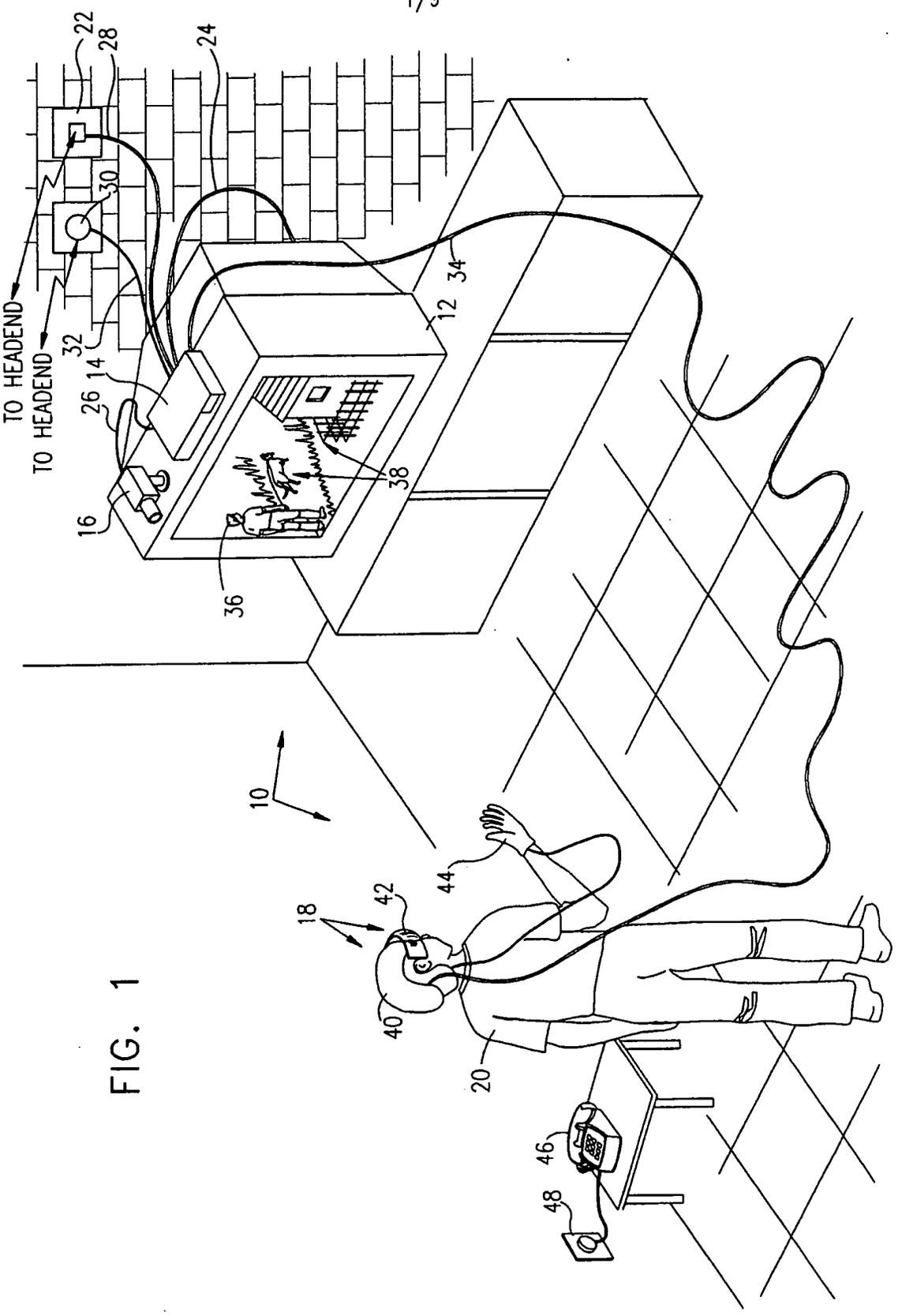

22
28
24
30
TO HEADEND
TO HEADEND
32
14
26
16
12
34
38
36
10
18
42
44
40
20
46
48

FIG. 1

FIG. 2

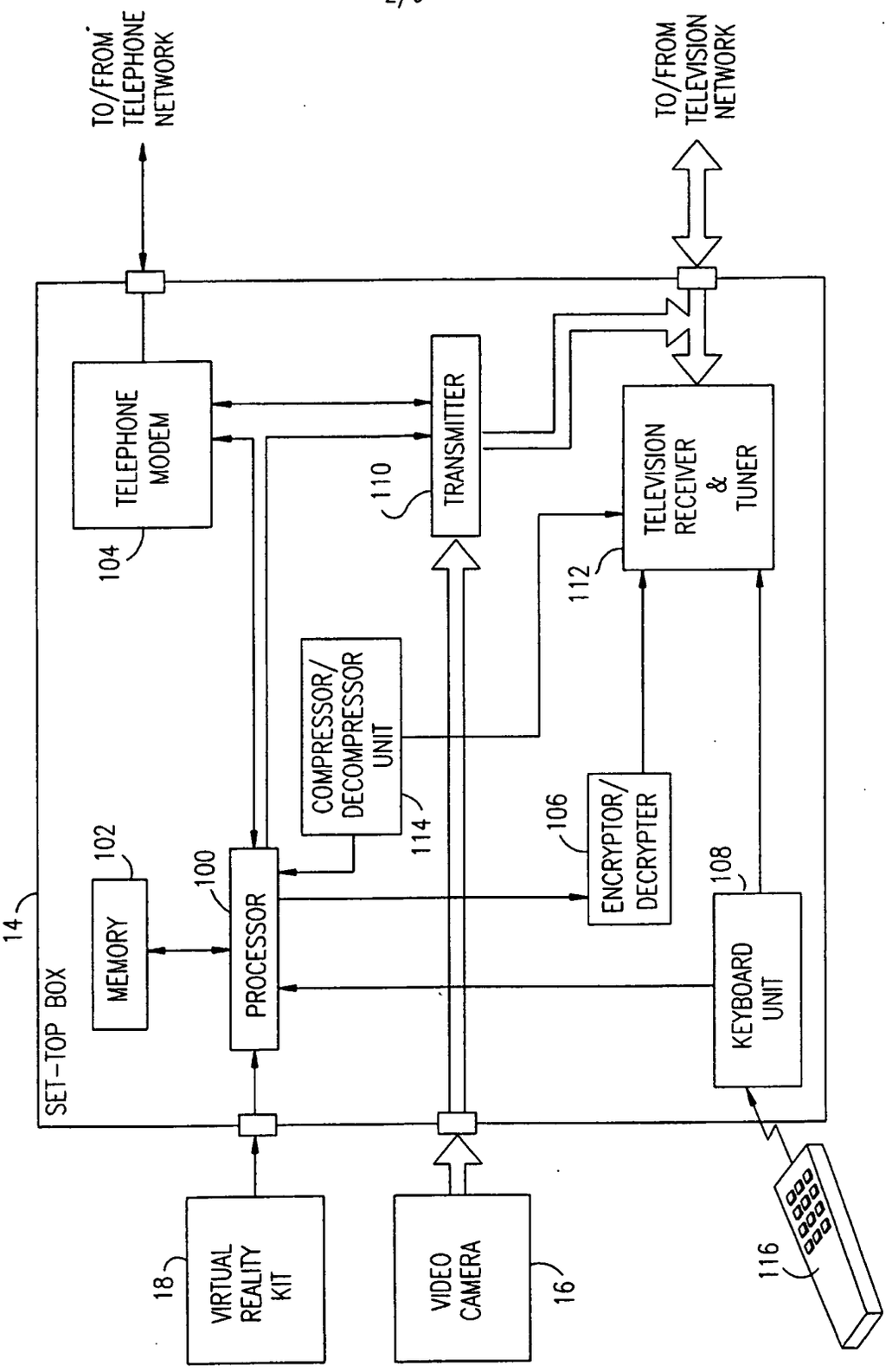

TO/FROM TELEPHONE NETWORK
TO/FROM TELEVISION NETWORK
TELEPHONE MODEM
104
TRANSMITTER
110
TELEVISION RECEIVER & TUNER
112
COMPRESSOR/ DECOMPRESSOR UNIT
114
ENCRYPTOR/ DECRYPTER
106
KEYBOARD UNIT
108
MEMORY
102
PROCESSOR
100
14
SET-TOP BOX
VIRTUAL REALITY KIT
18
VIDEO CAMERA
16
116

FIG. 3

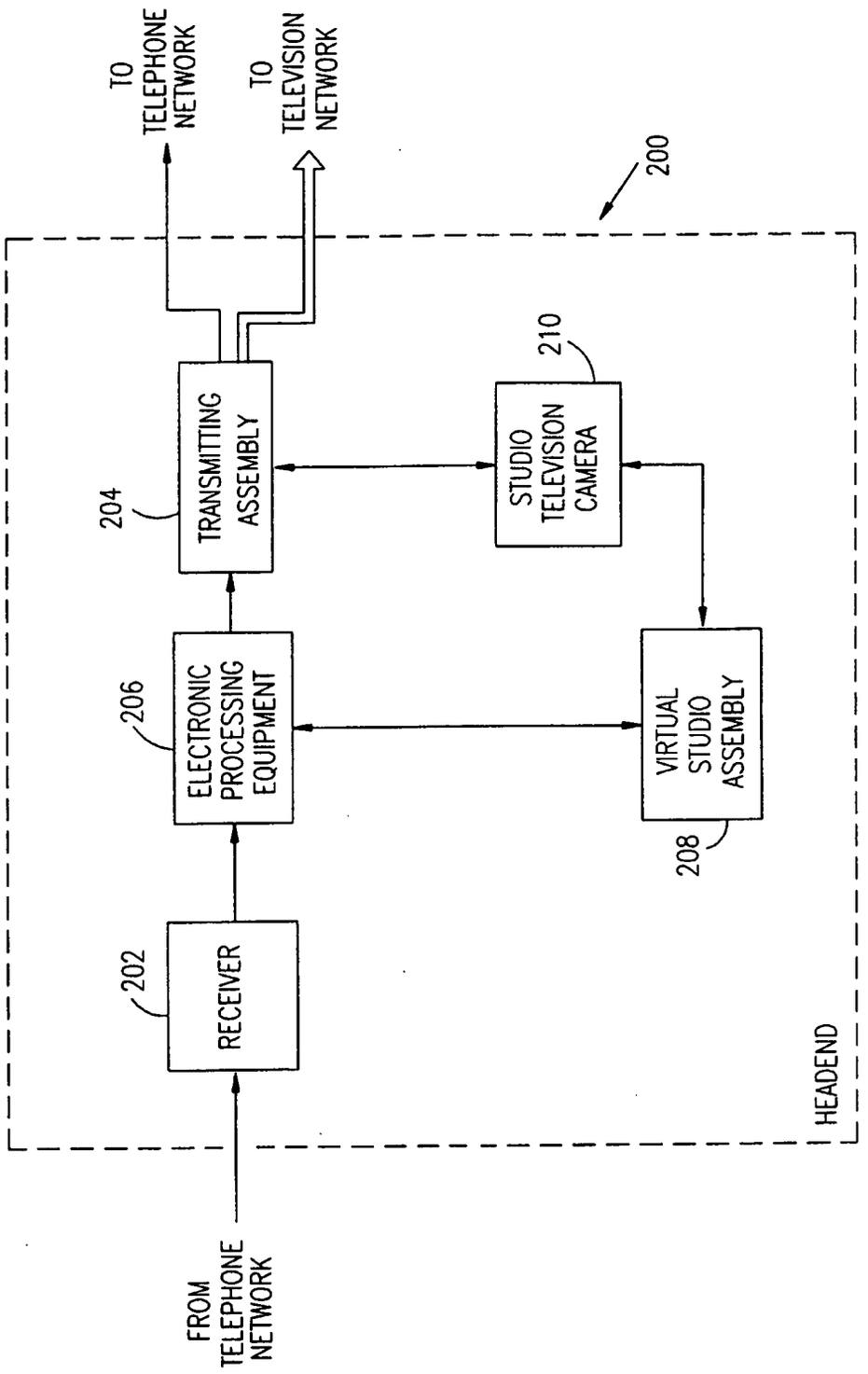

TO TELEPHONE NETWORK
TO TELEVISION NETWORK
200
210
STUDIO TELEVISION CAMERA
204
TRANSMITTING ASSEMBLY
206
ELECTRONIC PROCESSING EQUIPMENT
VIRTUAL STUDIO ASSEMBLY
208
202
RECEIVER
HEADEND
FROM TELEPHONE NETWORK

FIG. 4

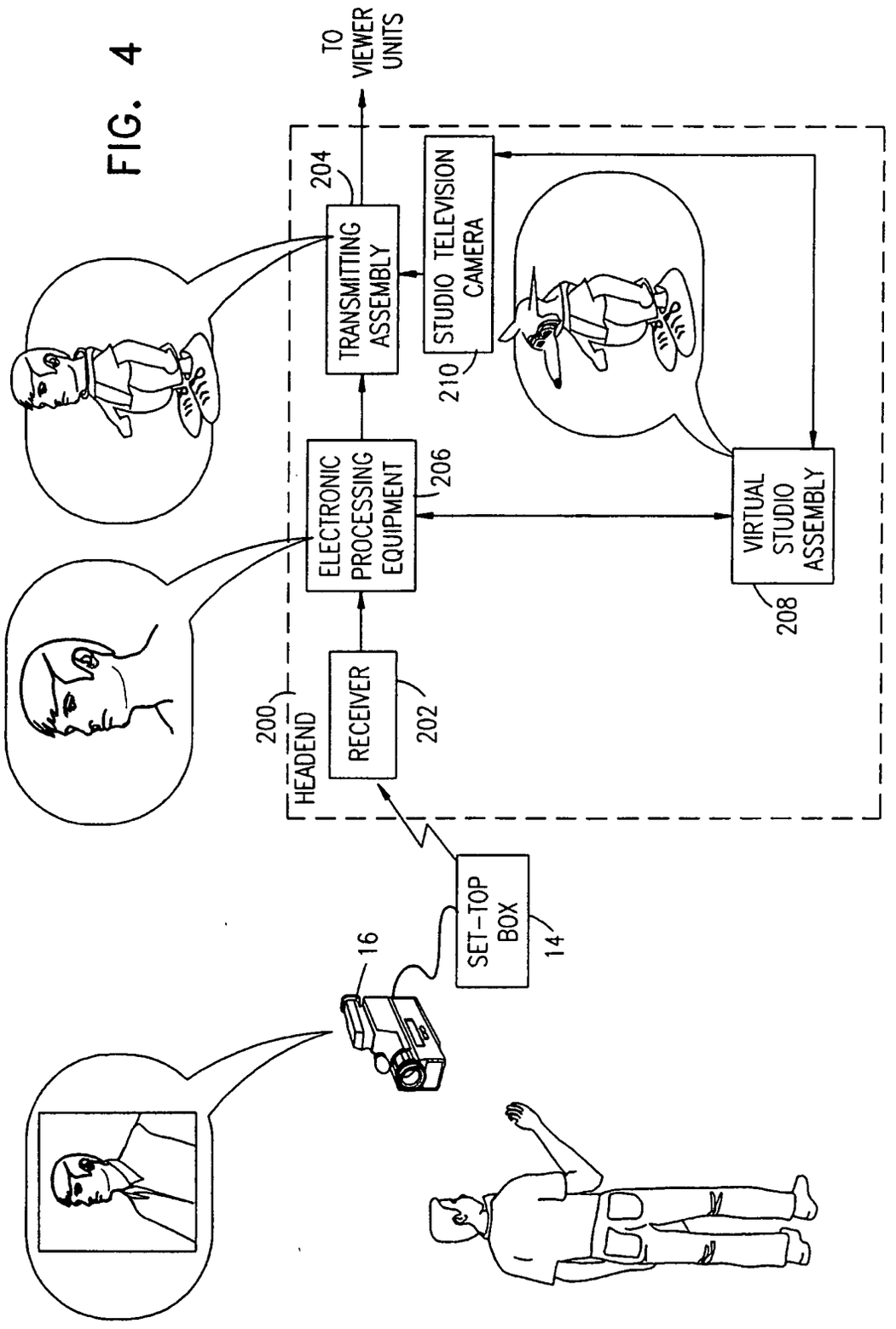

TO VIEWER UNITS
204
TRANSMITTING ASSEMBLY
STUDIO TELEVISION CAMERA
210
ELECTRONIC PROCESSING EQUIPMENT
206
VIRTUAL STUDIO ASSEMBLY
208
200
HEADEND
RECEIVER
202
SET-TOP BOX
14
16

FIG. 5

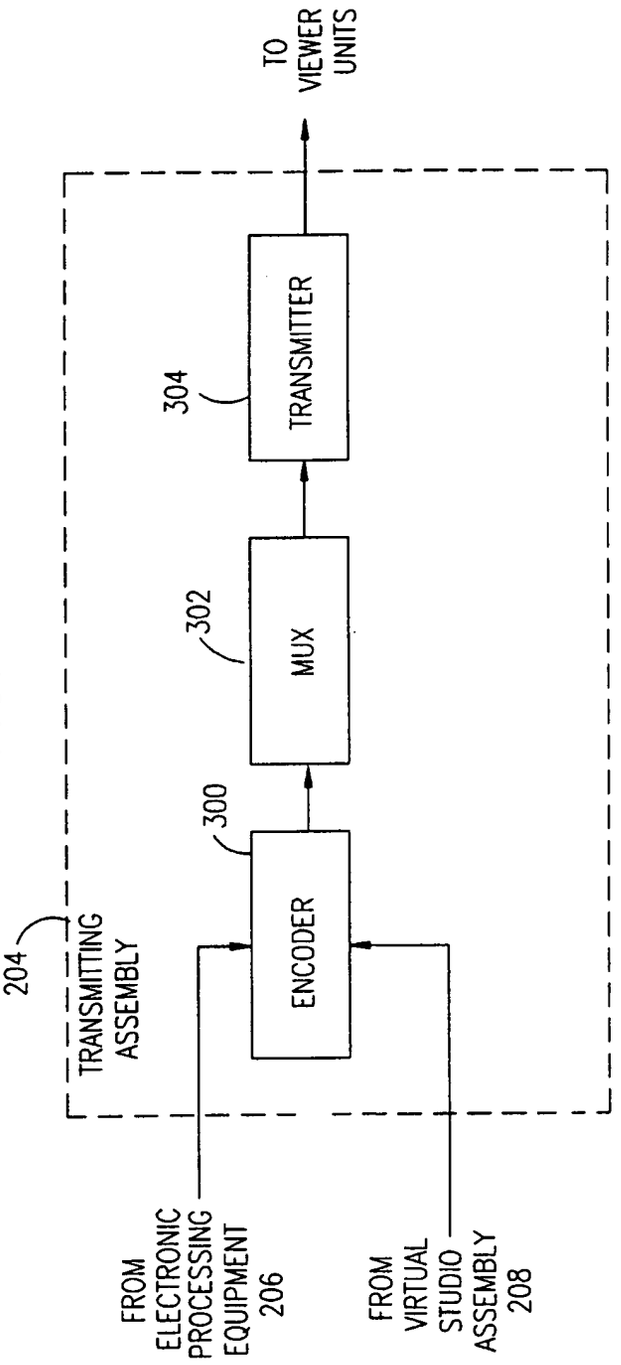

TO VIEWER UNITS
TRANSMITTER
304
MUX
302
ENCODER
300
TRANSMITTING ASSEMBLY
204
FROM ELECTRONIC PROCESSING EQUIPMENT 206
FROM VIRTUAL STUDIO ASSEMBLY 208

FIG. 6A

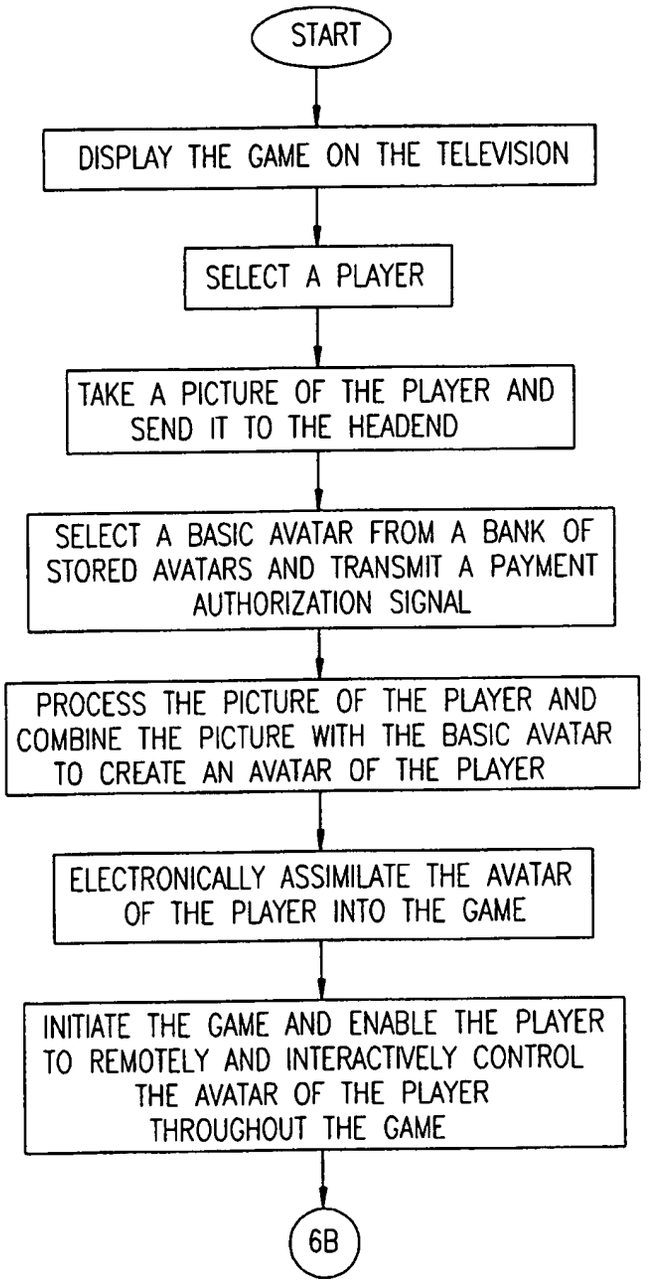

START
DISPLAY THE GAME ON THE TELEVISION
SELECT A PLAYER
TAKE A PICTURE OF THE PLAYER AND SEND IT TO THE HEADEND
SELECT A BASIC AVATAR FROM A BANK OF STORED AVATARS AND TRANSMIT A PAYMENT AUTHORIZATION SIGNAL
PROCESS THE PICTURE OF THE PLAYER AND COMBINE THE PICTURE WITH THE BASIC AVATAR TO CREATE AN AVATAR OF THE PLAYER
ELECTRONICALLY ASSIMILATE THE AVATAR OF THE PLAYER INTO THE GAME
INITIATE THE GAME AND ENABLE THE PLAYER TO REMOTELY AND INTERACTIVELY CONTROL THE AVATAR OF THE PLAYER THROUGHOUT THE GAME
6B

FIG. 6B

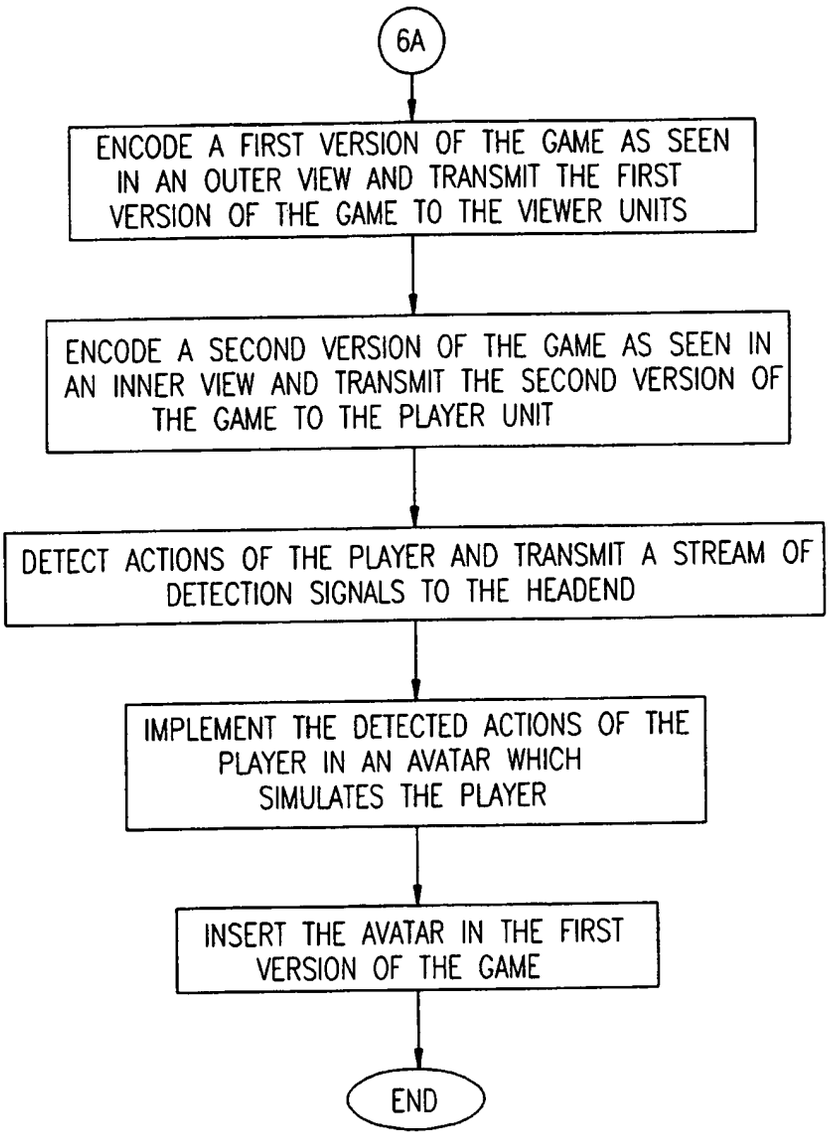

6A
ENCODE A FIRST VERSION OF THE GAME AS SEEN IN AN OUTER VIEW AND TRANSMIT THE FIRST VERSION OF THE GAME TO THE VIEWER UNITS
ENCODE A SECOND VERSION OF THE GAME AS SEEN IN AN INNER VIEW AND TRANSMIT THE SECOND VERSION OF THE GAME TO THE PLAYER UNIT
DETECT ACTIONS OF THE PLAYER AND TRANSMIT A STREAM OF DETECTION SIGNALS TO THE HEADEND
IMPLEMENT THE DETECTED ACTIONS OF THE PLAYER IN AN AVATAR WHICH SIMULATES THE PLAYER
INSERT THE AVATAR IN THE FIRST VERSION OF THE GAME
END

FIG. 7

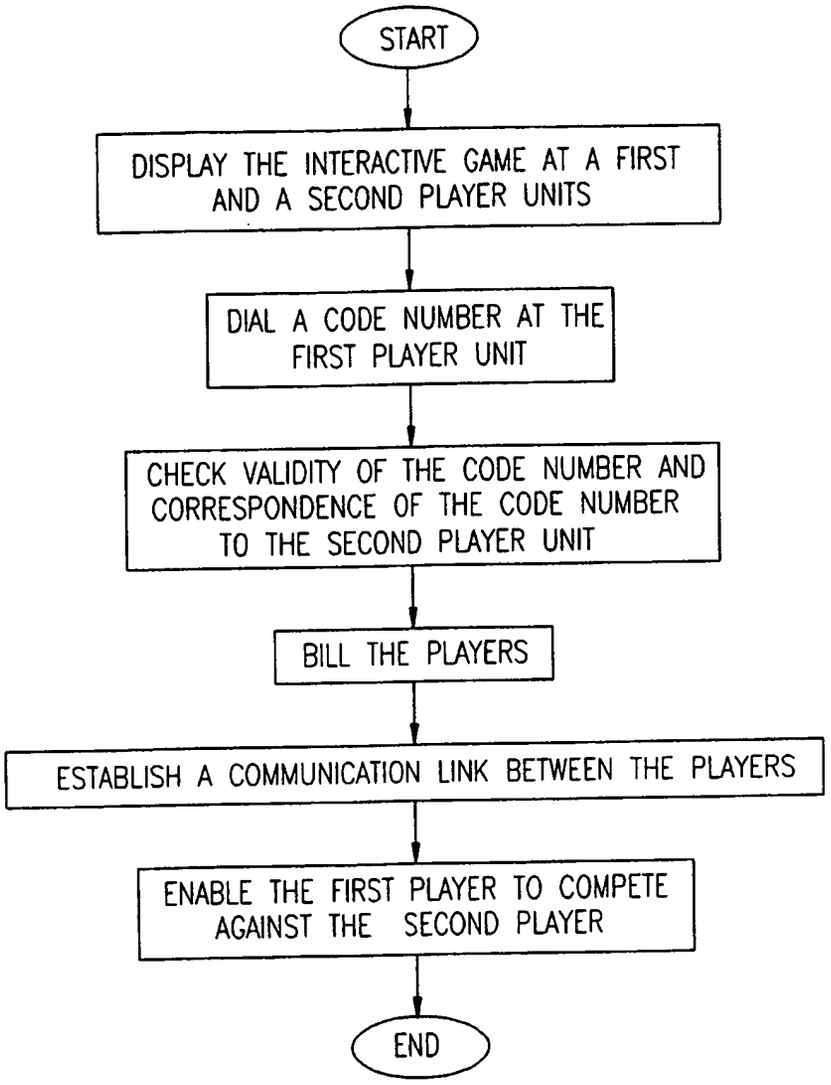
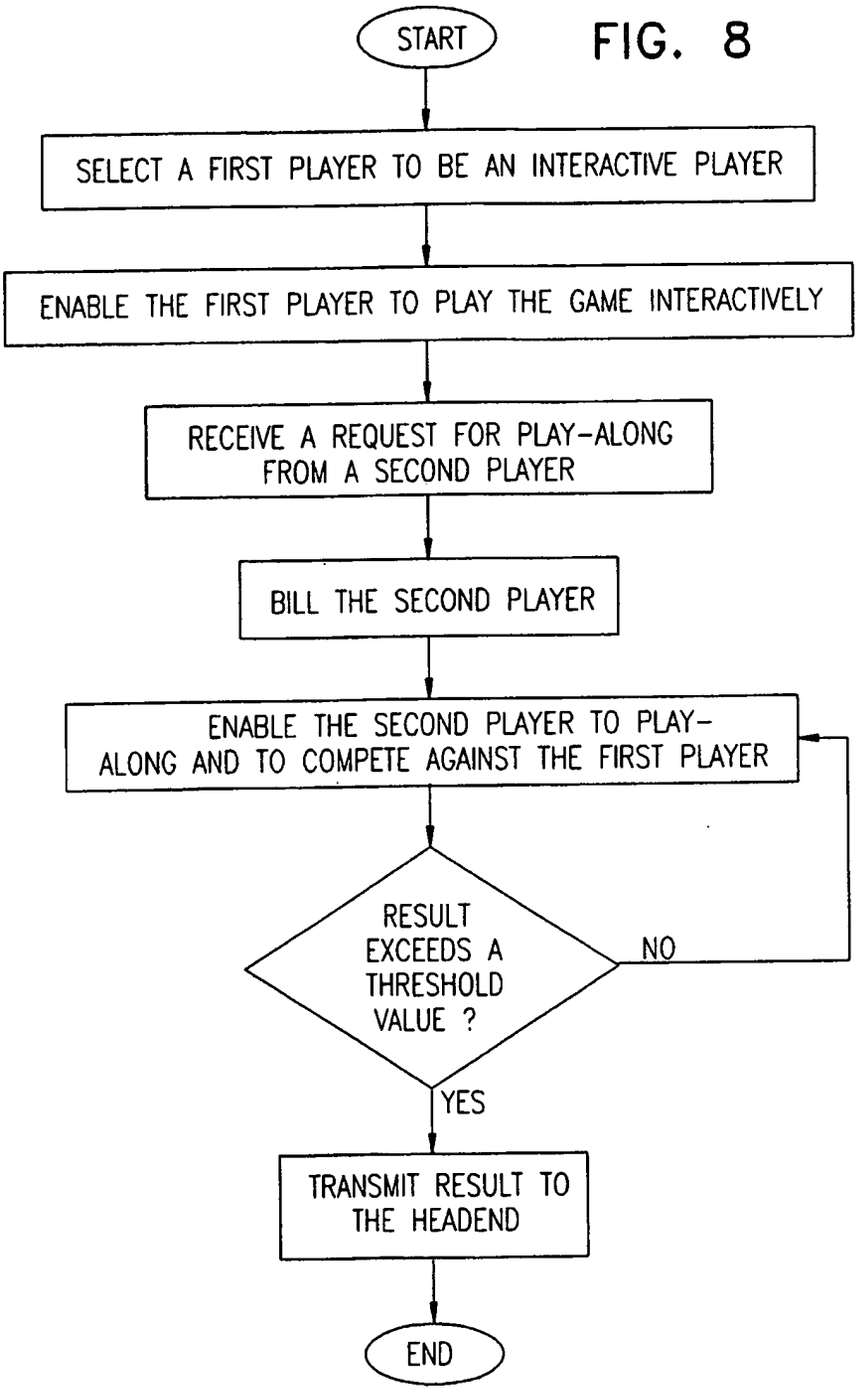

START
DISPLAY THE INTERACTIVE GAME AT A FIRST AND A SECOND PLAYER UNITS
DIAL A CODE NUMBER AT THE FIRST PLAYER UNIT
CHECK VALIDITY OF THE CODE NUMBER AND CORRESPONDENCE OF THE CODE NUMBER TO THE SECOND PLAYER UNIT
BILL THE PLAYERS
ESTABLISH A COMMUNICATION LINK BETWEEN THE PLAYERS
ENABLE THE FIRST PLAYER TO COMPETE AGAINST THE SECOND PLAYER
END

FIG. 8


START
SELECT A FIRST PLAYER TO BE AN INTERACTIVE PLAYER
ENABLE THE FIRST PLAYER TO PLAY THE GAME INTERACTIVELY
RECEIVE A REQUEST FOR PLAY-ALONG FROM A SECOND PLAYER
BILL THE SECOND PLAYER
ENABLE THE SECOND PLAYER TO PLAY-ALONG AND TO COMPETE AGAINST THE FIRST PLAYER
RESULT EXCEEDS A THRESHOLD VALUE ?
NO
YES
TRANSMIT RESULT TO THE HEADEND
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL98/00267

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :A63F 9/22, 9/24
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. : 463/30-31, 40-42

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)
None

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,372,558 A (SHIMAMOTO et al) 08 February 1983, entire document.	9
X --- Y	US 5,553,864 A (SITRICK) 10 September 1996, entire document.	1-4, 9 --- 10-31

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 30 SEPTEMBER 1998	Date of mailing of the international search report 15 OCT 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer For MARK SAGER Telephone No. (703) 308-2211 Sheila Veney Paralegal Specialist Technology Center 3700

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL98/00267

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

463/30-31, 36, 40-42; 395/200.3, 940, 955,, 957; 455/3.1, 4.1, 5.1, 6.3; 364/410.1

Form PCT/ISA/210 (extra sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL98/00267

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 5-8
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet(1))(July 1992)★

(12) UK Patent Application (19) GB (11) 2 327 837 (13) A

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(51) INT CL[6]
G06F 17/30

(52) UK CL (Edition Q)
H4T TBBN
H4F FBB

(56) Documents Cited
GB 2309134 A

(58) Field of Search
UK CL (Edition P) H4F FBB , H4T TBAX TBBN TDAA
INT CL[6] G06F 17/30
ONLINE: WPI, INTERNET

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United Kingdom

(54) Abstract Title
Transmission, reception and display of combined video data in a set area of a hyperlink data file.

(57) A video broadcast system includes a broadcast source that broadcasts a video stream and provides accompanying supplemental data files. Each supplemental data file is an HTML file having instructions for rendering a hyperlink overlay on the video stream. A receiver is configured to receive the video stream and accompanying supplemental data files and to display the hyperlink overlays in conjunction with the video stream. The overlays are designed having backgrounds of a pre-determined value which is used as a color key in receiving equipment. Specifically, the receiving equipment is configured to render video only in display areas that are set to the color key value. Thus, the video stream is rendered "behind" the hyperlink overlays, and the backgrounds of the overlays appears transparent. Control data is provided with the HTML files to indicate when the overlays should be rendered and to provide other instructions on how the HTML files should be handled by the receiving equipment.

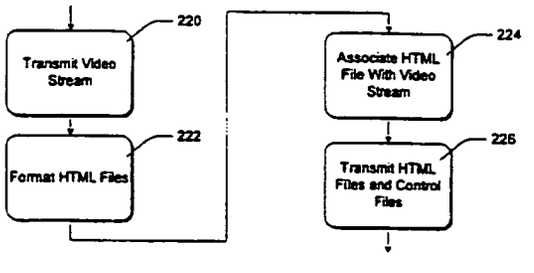

Fig. 4

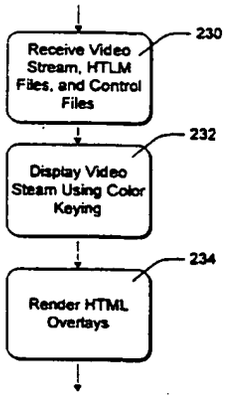

Fig. 5

GB 2 327 837 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

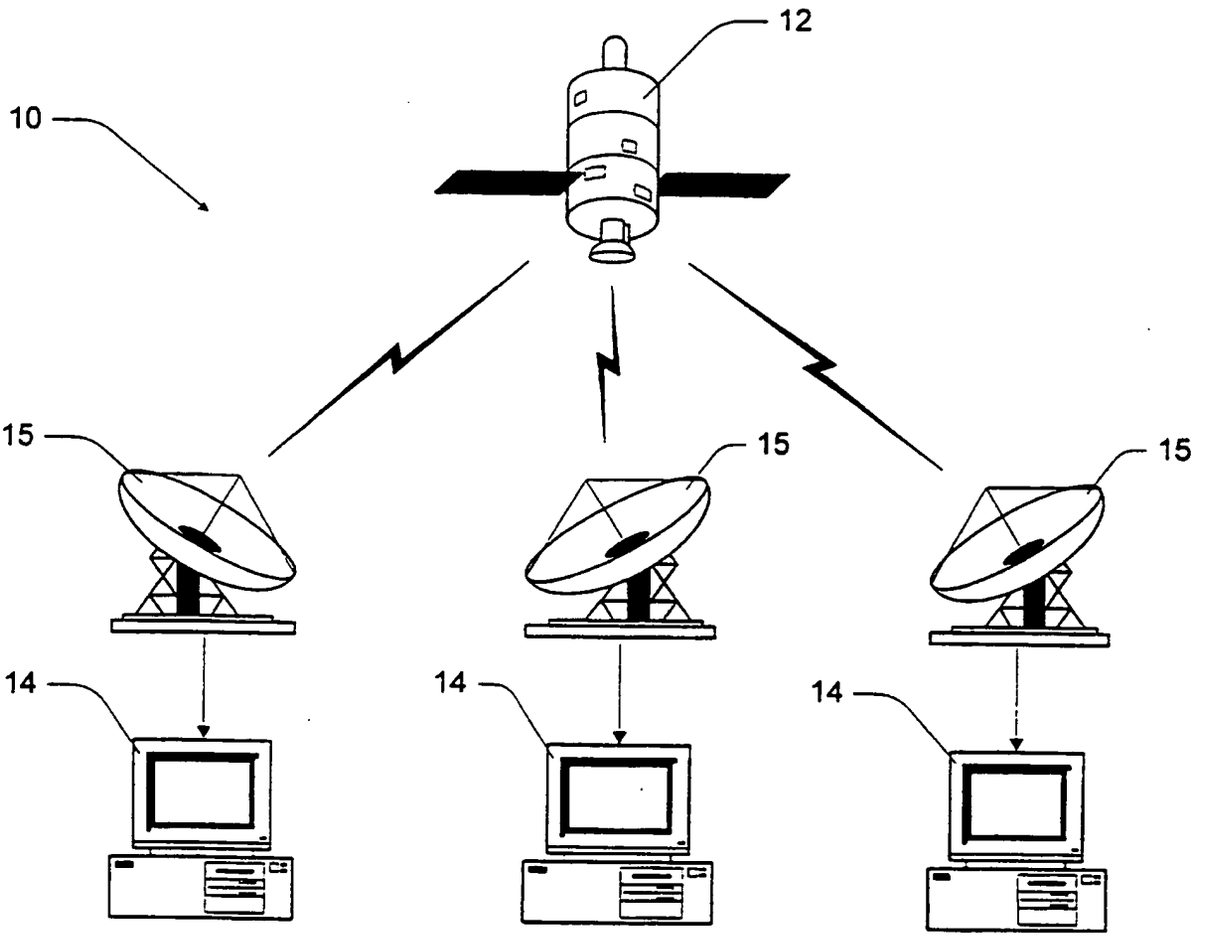

Fig. 1

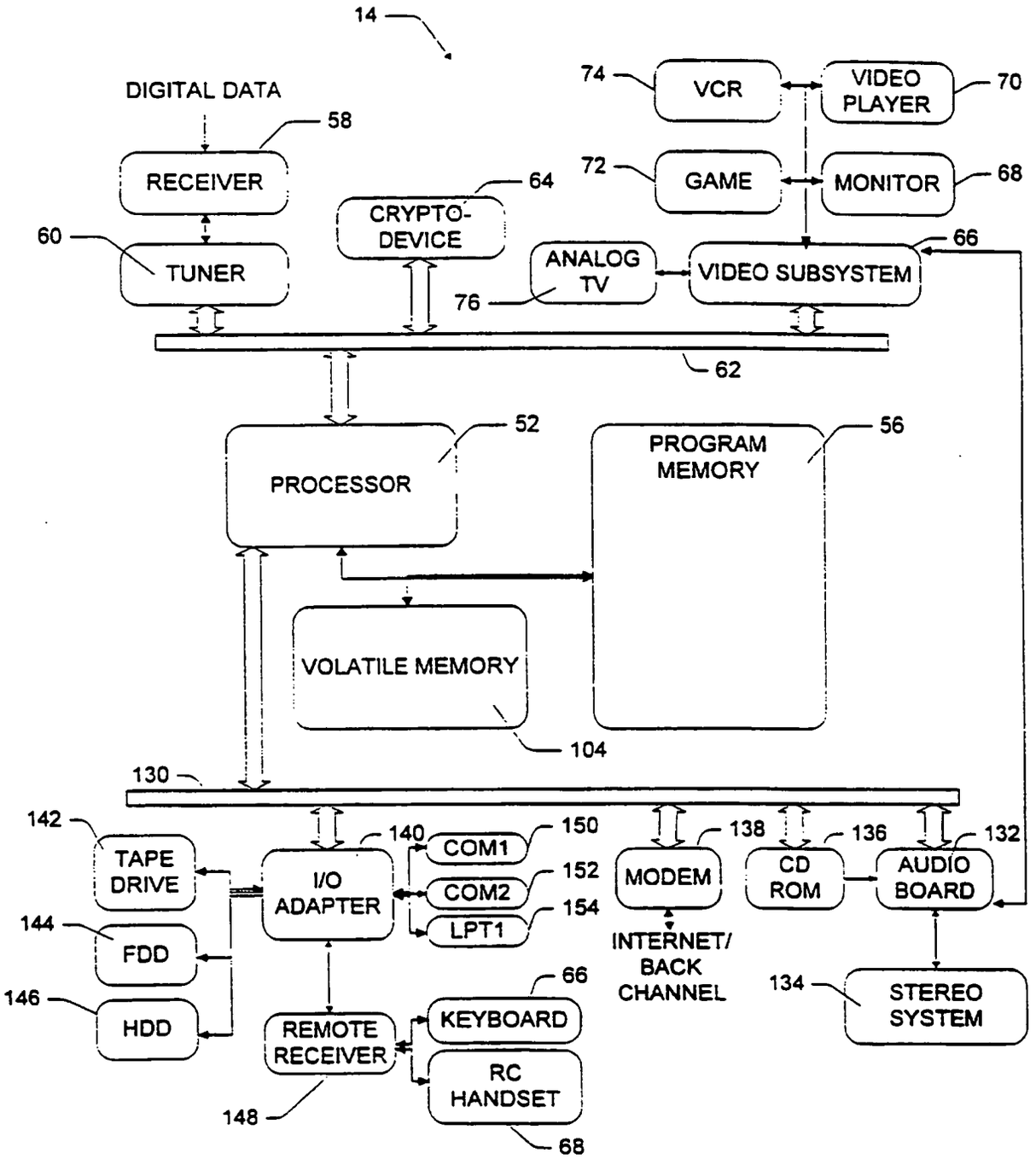
14
DIGITAL DATA
58
RECEIVER
60
TUNER
64
CRYPTO-DEVICE
74
VCR
VIDEO PLAYER
70
72
GAME
MONITOR
68
ANALOG TV
76
VIDEO SUBSYSTEM
66
62
52
PROCESSOR
56
PROGRAM MEMORY
VOLATILE MEMORY
104
130
142
TAPE DRIVE
144
FDD
146
HDD
140
I/O ADAPTER
COM1
150
COM2
152
LPT1
154
138
MODEM
INTERNET/ BACK CHANNEL
136
CD ROM
132
AUDIO BOARD
134
STEREO SYSTEM
66
KEYBOARD
REMOTE RECEIVER
148
RC HANDSET
68

Fig. 2

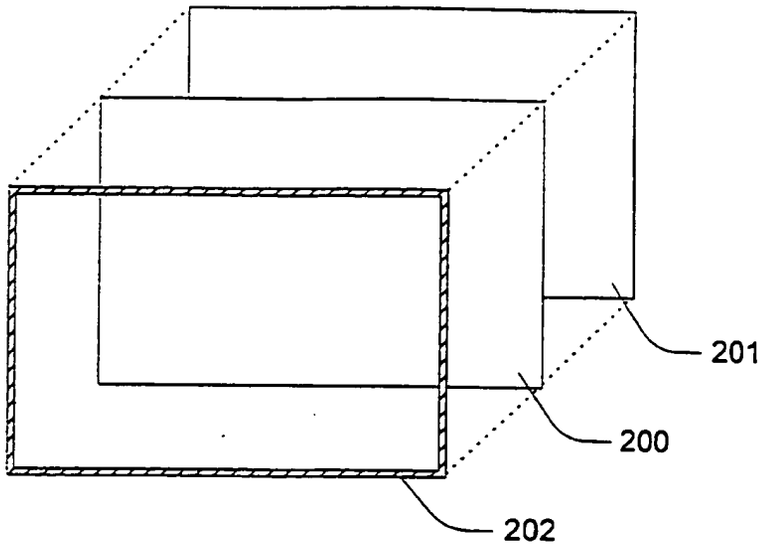
201
200
202

Fig. 3

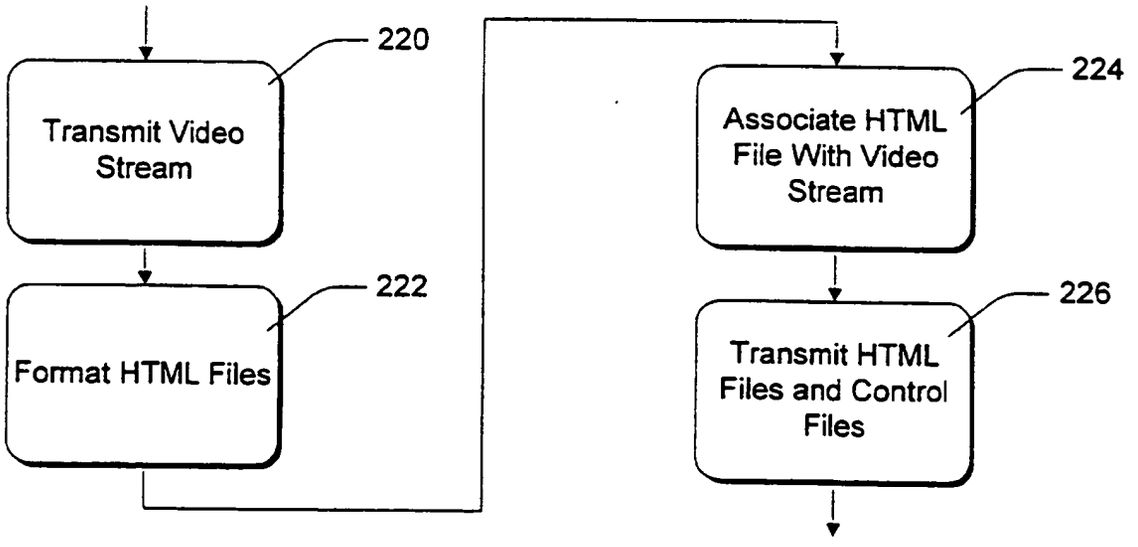
220
Transmit Video Stream
222
Format HTML Files
224
Associate HTML File With Video Stream
226
Transmit HTML Files and Control Files

Fig. 4

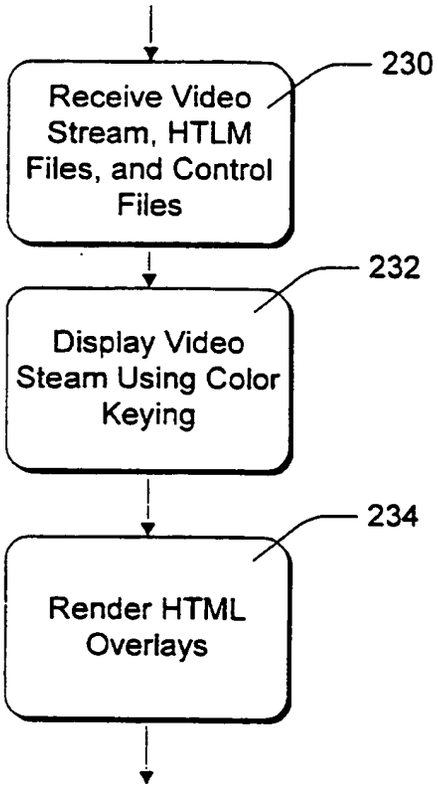
Receive Video Stream, HTLM Files, and Control Files
230
Display Video Steam Using Color Keying
232
Render HTML Overlays
234

Fig. 5

PROVIDING ENHANCED CONTENT WITH BROADCAST VIDEO

TECHNICAL FIELD

This invention relates methods and systems for providing and displaying ancillary data content with transmitted video and audio.

BACKGROUND OF THE INVENTION

Displaying live video on a personal computer (PC) is becoming more and more common. A number of low cost video capture boards allow for display of analog video signals on the RGB display surface of a personal computer. Moreover, higher quality digital video feeds distributed, for example, via Direct Broadcast Satellite (DBS), will soon also be available on PCs. With the right hardware, PCs will be able to display and decode DBS signals, analog cable signals, and over-the-air-signals, as well as analog and digital video signals stored locally (on a CD or VCR, for example).

In the future, television signal decoder circuitry for both analog and digital signals will become extremely prevalent, if not standard, on all PCs. By enabling a user or viewer to work with, view, and use both data and video simultaneously, the PC will better the user's or viewer's experience beyond a standard television.

In this new broadcast environment, television broadcasters will want to take advantage of PC capabilities by providing digital program enhancements. For example, a broadcaster might want to provide ancillary statistics during a sports broadcast, allowing a viewer to find more detailed information on a particular team or player. Similarly, a broadcaster might provide relevant information on the topic of a documentary, so that the viewer can access more detailed information either during or after the broadcast. As another example, it might be desired to advertise

program-related merchandise during a program—such as dolls or other toys during a children's cartoon program.

This method of delivering data to PCs is particularly attractive in areas of the world where there is not a great deal of traditional data infrastructure. For example, consider India which has a middle class population of about 300 million people (greater than the entire population of the US): while individuals can afford a PC and many do have PCs, few have experienced the Internet or high speed data networking, because of underdeveloped telecommunications infrastructure. The possibility of delivering data services to such locations presents a number of opportunities.

Recent years have also seen many efforts to develop what is referred to as "interactive television." Interactive television allows a viewer to interact with a cable television service provider. Various enhanced features are envisioned for interactive television systems. For instance, interactive program guides can be implemented for viewers. Using an interactive program guide, a viewer can scroll through television listings using cursor control buttons on a remote control. A viewer can also perform interactive searches of program content. Some interactive TV systems have included the ability for broadcasters to provide ancillary data along with video feeds.

There has been no widespread acceptance of any interactive television system. One impediment to such widespread acceptance is that each system uses different standards and protocols for providing data that is ancillary to the primary video content. Unless a single system is instituted as a standard, broadcasters will have to provide ancillary data in numerous different formats. This is a significant impediment.

The invention removes this impediment by utilizing conventional formats for providing ancillary data along with video broadcasts, along with a scheme for overlaying digital data content on the primary video stream.

SUMMARY OF THE INVENTION

The invention allows video broadcasters to prepare ancillary data content as HTML files. The HTML files are prepared as overlays, with backgrounds of a pre-determined color key for viewing with video equipment having color keying features. At a receiver, the HTML overlays are rendered using typical Internet browser technology in the same display area as broadcast video, using color keying. This makes the overlay background appear transparent: the video appears only in the background areas of the HTML overlays.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of a video broadcasting system in accordance with the invention.

Fig. 2 is a block diagram of an exemplary receiver in accordance with the invention.

Fig. 3 shows how video, HTML overlays, and frame windows are configured in accordance with the invention

Figs. 4 and 5 are flowcharts showing preferred methodological steps in accordance with the invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows a video broadcasting system in accordance with one embodiment of the invention, generally designated by reference numeral 10. Broadcasting system 10 includes a broadcast source 12 and a plurality of receivers 14. The broadcast source in this embodiment of the invention is a digital satellite system that broadcasts video content on multiple RF frequencies or channels. Alternatively, the broadcast source might be a traditional terrestrial television station and associated antenna, a cable system, or any analogous installation of equipment for transmitting video streams and accompanying data in analog or digital form.

In most instances, broadcast source 12 will support only uni-directional communications, and will be used predominately for unidirectional broadcasting or multi-casting to many receivers simultaneously without the receivers' foreknowledge. Broadcast source 12 might alternatively support bi-directional communication. Although only one broadcast source 12 is illustrated for explanation purposes, the broadcasting system can include multiple broadcast sources.

Broadcast source 12 includes means for transmitting or otherwise conveying a primary video stream and ancillary digital data content to receivers 14. In the case of digital satellite transmission, ancillary data can be easily transmitted in digital form along with video and audio streams. Protocols such as MPEG-2 already provide for incorporating ancillary digital data in packets that are downloaded with digital audio/video content using satellite transmission facilities. For example, existing DSS systems incorporate "hints" in MPEG streams to indicate aspect ratios for correct display by receivers. Another example is in the

analog realm, in which Philips sells a device called the Ghost Echo Cancellation Reference Signal. By injecting a known digital stream on a single analog television VBI line, advanced televisions or PCs can more easily detect when a multipath (ghost) signal is received and take measures to clean up the image. There are about 800 TV stations in the US that implements this signal.

When using more traditional broadcast sources, such as analog RF television broadcasts, data can be transmitted in the vertical blanking interval of the television signal. This method is currently used to provide closed captioning for the hearing impaired. Digital data that has been transmitted in this way can be extracted from a television signal in a number of ways that are known in the industry—most currently-manufactured televisions have the capability of extracting and displaying closed captioning information. External closed caption decoders are also available for this purpose. Additionally, a number of external devices are available which extract closed caption data and transmit it over a serial cable to personal computers or other devices. More recently, it has become possible to decode closed captioning data directly inside a PC using newer video and video tuner boards that allow for a television signal to be displayed on a PC.

There are other mechanisms that are also available for transmitting digital data content to receivers 14. For example, it is possible to use a modem or other conventional network connection for digital data transmissions. Network connections such as these are independent of the traditional video transmission media, and have the advantage that they allow bi-directional communications between the broadcast source and the receivers. Communication facilities such as the Internet can also be utilized. Cable television networks might also provide similar communications capabilities. In addition, the newest plans for high-

definition digital terrestrial TV define channels that are capable of transmitting 19.3 megabit/second of any amount of digital video or data.

It should be noted that the audio/video stream and the digital data content can be distributed using different media, respectively. While it is convenient to use only a single media such as over-the-air transmission, it would also be possible to distribute the digital data content using a physical medium such as a CD-ROM, while the video is delivered using traditional broadcasts. Alternatively, both video and data might in some cases be distributed using a physical, transportable medium such as a CD-ROM.

In the preferred embodiment of the invention, broadcast source 12 broadcasts an analog or digital video stream and provides supplemental digital data files to accompany the video stream. These data files have digital content that can be rendered by receivers 14, apart from the video stream. The broadcast source also provides timing specifications with the supplemental data files indicating times for displaying the digital content, relative to the video stream.

The digital content is preferably authored in a standard, commonly used graphical markup language. In the preferred embodiment of the invention, the supplemental data files are prepared and formatted in a current version of a Hypertext Markup Language (HTML). This allows broadcasters to use standard, widely accepted authoring tools such as used for authoring Internet World Wide Web content.

The supplemental digital data content preferably comprises one or more hyperlink overlays. Each hyperlink overlay includes one or more hyperlinks. A hyperlink is a displayed region or entity that can be selected or activated by a viewer. Each hyperlink has a target, indicating some other content (usually stored

in a data file) that can be rendered for the viewer. When a hyperlink is activated, its target is retrieved and rendered. For example, if the target is a text document, the document is displayed. If the target is a file containing a digitized sound clip, the sound clip is rendered. The most common use of hyperlinks is to move or "navigate" from one document or object to another.

It will be apparent to those familiar with Internet technology that the hyperlink overlays described above are similar to documents (often referred to as "Web pages") that can be viewed when browsing the Internet's World Wide Web. This is an attractive feature of the invention, because it allows broadcasters to use existing Internet content development tools for designing ancillary digital data content.

One difference from a conventional Web page is that a hyperlink overlay in accordance with the invention has a background that is set to a predetermined key color. Background areas, set to the key color, are intended to be transparent. A background such as this is easily created, again using standard Internet content development tools such as Microsoft's Front Page® web designer.

In this embodiment of the invention, receivers 14 are conventional personal computers (PCs) with equipment having display hardware for receiving and displaying broadcast video streams such as television signals and digital video broadcasts. The PC is also associated with a satellite dish 15 for receiving digital satellite broadcasts, or a regular antenna for receiving analog TV signals.

The display hardware includes bit-mapped graphics capabilities for displaying static bit-mapped images in conjunction with conventional application programs, in addition to video display capabilities. Furthermore, PCs 14 include

video color keying hardware that can be configured to display video only in display areas that are set to a key color.

Alternatively, receivers 14 might comprise other types of devices such as enhanced television units having capabilities similar to the PC described herein.

As an example implementation, PC 14 is a personal computer having a processor (e.g., x86 or Pentium® microprocessor from Intel Corporation), memory, a computer monitor (e.g., VGA, SVGA), and one or more input devices (e.g., keyboard, mouse, etc.).

PC 14 has a digital receiver configured to receive digital broadcast data in a packetized format such as MPEG-encoded digital video and audio data. Such a digital receiver also has access means for reading supplemental data files received from satellite broadcasts—the receiver can receive digital data in many different forms, including software programs, programming information, and other ancillary data in the form of data files.

The PC runs an operating system that supports multiple applications. The operating system is preferably a multitasking operating system that allows simultaneous execution of multiple applications. The operating system employs a graphical user interface in a windowing environment which presents the applications or documents in specially delineated areas of the display screen called "windows." One preferred operating system is a Windows® brand operating system sold by Microsoft Corporation, such as Windows 95 or Windows NT, Windows CE or other derivative versions of Windows®. It is noted, however, that other operating systems that provide windowing environments may be employed, such as the Macintosh operating system from Apple Computer, Inc. and the OS/2 operating system from IBM.

One example implementation of a broadcast-enabled PC is described in a co-pending U.S. Patent Application Serial No. 08/503,055, entitled "Broadcast-Enabled Personal Computer," filed January 29, 1996. This application is assigned to Microsoft Corporation, and is incorporated herein by reference.

Fig. 2 shows an example implementation of PC 14 in more detail. PC 14 is enhanced for purposes of displaying broadcast television and accompanying digital data content. It includes a motherboard (not shown) having a processor 52 (e.g., x86 or Pentium® microprocessor from Intel Corporation) and volatile memory 54. Volatile memory 54, in combination with non-volatile memory 55, forms program storage memory 56. Non-volatile memory 55 comprises a floppy disk, a hard disk, a CD-ROM, or some other type of computer-readable storage media. Application programs, containing instructions for performing the steps described herein, are contained in the storage media.

PC 14 includes a digital broadcast receiver 58, such as a satellite dish receiver, RF receiver, microwave receiver, or the like. The digital receiver 58 receives digital data broadcast over a broadcast network such as a satellite network. The receiver 58 is coupled to a tuner 60 which tunes to frequencies or channels of the broadcast network. The tuner 60 has one or two primary components: a specialized digital broadcast tuner and/or a generalized digital broadcast tuner. The specialized digital broadcast tuner is configured to receive digital broadcast data in a particularized format, such as MPEG-encoded digital video and audio data. The generalized digital broadcast tuner is configured to receive digital data in many different forms, including software programs and other ancillary data.

The tuner 60 is connected to the motherboard and data processor 52 via a multi-bit bus 62, such as a 32-bit PCI (Peripheral Component Interconnect) bus. An optional cryptographic device 64 provides cryptographic services for the client, such as encryption, decryption, authentication, and digital signing.

The PC 14 has a video subsystem 66 connected to the PCI bus 62. Video and audio data is transferred from tuner 60 over PCI bus 62 to the video subsystem 66. In some embodiments, tuner hardware instead decodes an MPEG stream itself without ever passing the data over the PCI bus. In such systems, the uncompressed raw YUV video is sent along a simple wire connection to the video subsystem 66board. In the illustrated embodiment, however, the video subsystem 66 includes circuitry for decoding MPEG-encoded or other video data formats. Video subsystem 66 also includes video display drivers for driving a computer monitor 68.

The video subsystem 66 supports many peripheral devices, in addition to the monitor 68. For instance, the video subsystem 66 might be connected to a laser video player 70 for playing DVD (digital video disks), a game machine 72 for playing video games, and a VCR (video cassette recorder) 74 for recording programs. The video subsystem 66 is adapted for connection to an analog broadcast television system 76 to receive conventional TV signals from cable television or RF broadcast television systems. This enables backwards compatibility to analog TV systems.

Video subsystem 66 also incorporates color keying features that aid in integrating video with static bit-mapped graphics. With color keying, an application program or the operating system configures the video subsystem to display a video stream in a rectangular area or "viewport" of monitor 68 in

conjunction with whatever bit-mapped monitor image has been put in place by executing software. In effect, the video subsystem overwrites the normal bit-mapped display image with the video stream. However, the video subsystem is configured to overwrite only those areas of the bit-mapped display image that are set to a predetermined color or chroma key value. Thus, a bit-mapped image can be created having "transparent" areas or regions that are set to the color key value. The video stream will be displayed only in these transparent regions, so that the bit-mapped image will appear to overlay the video stream.

Tseng Labs, Cirrus Logic, Brooktree, ATI and S3 are examples of companies that manufacture video subsystems such as this.

Monitor 68 is preferably a VGA or SVGA monitor as is customary for personal computers, as opposed to a standard television. In the illustrated implementation, PC 14 does not convert the television-related data into an NTSC (National Television System Committee) format. Because of this, PC 14 is able to produce television data having superior quality when displayed on the VGA monitor. Other embodiments might convert images from VGA to NTSC for display on a standard TV screen, although they would have comparatively lower graphics resolution.

The PC 14 also includes a second bus 130, such as an ISA (Industry Standard Architecture) bus, coupled to the motherboard and data processor 52. An audio board 132 is coupled to the ISA bus 130 and serves as an interface with a number of audio output devices, such as conventional speakers. An amplifier may be coupled between the audio board and speakers if desired. The audio board is also coupled to the video subsystem 66 to receive decoded audio signals. The audio board 132 can be coupled to a stereo system 134, so that audio data can be

output to the stereo system for enhanced sound and recorded. Newer computer systems might alternatively support sending digital audio streams outside the PC via a Universal Serial Bus or IEEE1394 connection to an external converter. This eliminates the need for an internal sound card and results in much higher fidelity audio.

A CD-ROM (or DVD) drive 136 is coupled to the ISA bus 130. The audio output produced by the CD ROM (or DVD) drive 136 is passed to the audio board 132.

PC 14 includes a modem 138, such as a 14.4 or 28.8 kbps fax/data modem, coupled to the ISA bus 130. The modem 138 is connected to a conventional telephone line and provides access to public networks, including the Internet. The modem 138 can be used to access and download data and supplemental content directly from an independent service provider. It can also be used to download supplemental data files originating from a broadcast source. Additionally, the modem 138 can be used for two-way communications with the broadcast source or another entity providing broadcast-related services.

An input/output (I/O) adapter 140 is coupled to the ISA bus 130 to interface with numerous I/O devices, including a digital tape driver 142, a floppy disk drive 144, and a hard disk driver 146. A remote receiver 148 is also coupled to the I/O adapter 140 for receiving signals from the remote cordless keyboard 66 and remote control handset 68 in an IR or RF format. Alternatively, the keyboard and handset can be directly wired to the computer. The I/O adapter 140 further provides conventional serial ports, including a COM1 port 150, a COM2 port 152, and an LPT1 port 154. An IR transmitter (not shown) can be coupled to the COM1 port 150 to generate infrared signals to control electronic devices, such as stereo

equipment, VCR, and the like. The computer 60 can also be hooked directly to these components.

In accordance with the invention, PC 14 is programmed or configured to receive a digital video stream and accompanying HTML files from a broadcast source, and to display the video stream in conjunction with the hyperlink overlays defined by the HTML files.

Fig. 3 shows how this is accomplished. An overlay window 200 is opened for displaying a hyperlink overlay. Video subsystem 66 is configured to display the video stream in a viewport 201 that coincides in size and position with the overlay window 200. The video subsystem is also configured to display the video stream only over those areas of the hyperlink overlay that are not set to the predetermined color key. Thus, non-transparent areas of the hyperlink overlay appear "through" the video stream, and appear to overlay the video stream. Perhaps the best example of this behavior is the TV weatherman who appears to "float" in front of a weather map. A frame window 202 is also utilized to define the edges of overlay window 200 and viewport 201. These three components are configured to appear as a single window to a user. Operating software is configured so that the user can resize and move the components as a single entity.

Overlay window 200 is preferably implemented using an ActiveX™ control that is designed specifically for displaying an HTML-formatted document. Such an ActiveX™ HTML control is configured to also allow browsing or navigating among documents by activating hyperlinks. ActiveX™ is a standard for interchangeable components that has been defined by Microsoft Corporation. ActiveX™ controls are display entities that allow a user or viewer to interact with programs through the display. In this case, the control displays an HTML-

formatted document, allows the user to activate hyperlinks, and retrieves and displays the targets of such hyperlinks. A conventional HTML browser can alternatively be used for displaying the hyperlink overlays.

Rather than associating displayed icons with hyperlinks, it is also possible to create a totally transparent imagemask (using HTML terminology) to be overlaid on top of the video. This results in "hot spots" on the screen that can be clicked on for an action to occur. An example of this might be to create a hotspot on top of an actor's body; clicking on the hotspot would reveal what the character was thinking. Another example: a user could click on Tim Allen's Binford saw during an episode of "Tool Time" to find out more information about it such as where to purchase it.

Hyperlink overlays can be provided in groups corresponding to a particular video stream, allowing navigation among various individual overlays of the group. For example, a related group of overlays might be provided to a PC prior to the beginning of a particular episode of a weekly television show. The first of the overlays would be displayed at the beginning of the episode, and the viewer could then follow hyperlinks as desired to view the other overlays of the group.

Alternatively, timing and other information can be provided to the PC along with communication packets in which the overlays are transmitted. The timing information indicates times, relative to the video stream, at which particular overlays should be displayed. Hyperlinks can be activated to override the specified timing. An alternative method to synchronize the video that doesn't rely upon specific timing relative to the video stream is by using closed-caption text. By examining a closed-caption stream, specific events can be triggered to occur based upon when the actors on the screen enunciate certain words that serve as

reference marks. Such technology is described in a co-pending US patent application Serial No. 08/779,270, entitled "System and Method For Synchronizing Content With A Video Program Using Closed Captioning," filed January 6, 1997. This patent application, which is assigned to Microsoft Corporation, is hereby incorporated by reference.

PC 14 uses a stack-based algorithm to handle multiple overlays, so that one overlay can be temporarily overwritten by another. For example, an emergency news transmission might have overlays that would overwrite a regularly scheduled show. When the emergency news transmission is complete, the previous overlays are restored.

Fig. 4 shows preferred methodological steps performed by broadcast source 12 in accordance with the invention. A step 220 comprises transmitting a video stream. The video stream can be in one of a variety of formats, such as a traditional analog RF television format or a digital format originating from a satellite or a cable headend.

A step 222 comprises formatting supplemental data files in a graphical markup language, preferably HTML. Each supplemental HTML data file has instructions for rendering a hyperlink page or overlay on the video stream at an indicated time. Each overlay can have transparent areas or regions, which are set to a key color or chroma color. Overlays can also contain hyperlinks to other overlays and to other non-overlay documents and objects.

A step 224 comprises associating the supplemental data files with the video stream. This step is performing by specifying control data such as timing parameters along with the video stream, indicating times for displaying the hyperlink overlays in relation to the video stream. Note that supplemental files are

sent prior to the time that they will be needed, taking data transmission speed into account.

Step 226 comprises transmitting the supplemental data files along with the video stream. As already discussed, this can be accomplished using the built-in capabilities of the digital transmission media or using the vertical blanking interval of a traditional analog television signal.

Fig. 5 shows steps performed by PC 14 or another receiver. A step 230 comprises receiving the video stream and accompanying supplemental from the broadcast source. Step 232 comprises displaying the video stream on a display device in a viewport using color keying technology, so that the video stream is actually displayed only on areas of the display that are set to a predetermined key color or chroma color.

A step 234 comprises displaying the hyperlink overlays, defined by the supplemental data files, on the display device in conjunction with the video stream. If the overlays have been previously cached, this step includes retrieving them from cache storage. Control data, received along with the supplemental data files, is used in this step to associate hyperlink pages or overlays with the video stream. As a result, overlays are displayed at the times indicated by the timing specifications contained in the control data, rather than at the time they are received.

In the default case, an ActiveX™ control is used to display the hyperlink overlays and to allow navigation using hyperlinks in the overlays. The ActiveX™ control is configured to occupy the same area as the video stream viewport. Thus, the video stream is rendered in the transparent areas of the hyperlink overlays. In some cases, PC 14 might actually create or render the ActiveX™ control ahead of

time, although the control is not made visible until the appropriate time. This avoids any delay in presenting overlays.

Alternatively, control data might define multimedia objects that are not transparent hyperlink overlays. When this is the case, a separate application program is launched, such as an HTML-compatible browser, to render the object defined by a supplemental data file. Such an application program is launched in its own, independent window, and in the case of visually-oriented objects, can be viewed alongside the video stream.

As noted, control data, transmitted along with the supplemental data files, indicates how the supplemental data files should be handled. Primarily, the control data indicates times at which the data files should be rendered or made visible. In addition, the control data indicates what should happen when a viewer activates a hyperlink from within an overlay. Generally, activating a hyperlink causes its target to be displayed or otherwise rendered. However, there are two options when a hyperlink's target is another transparent overlay: the target can either replace the currently displayed overlay or the target can be displayed by an independent browser in a new window that is opened just for this purpose. If the hyperlink's target is not a transparent overlay, there is only one choice: the target is displayed in a new window by launching an appropriate application program. Step 234 thus includes a step of launching application programs as required to render non-overlay content targeted by hyperlinks.

In the PC embodiment described above, these steps are performed under the control of data processor 52, during execution of programming instructions that are stored in program memory 56.

While the invention has been described primarily for use with broadcast video streams, note that video streams might also be available through other means such as local storage (hard disk, DVD, CD, VCR, etc.). The invention is also useful in conjunction with video sources such as these. For instance, a movie might be provided on a DVD along with a group of transparent HTML overlay files for use along with the movie. Alternatively, the movie might be provided on a DVD, with the overlay files being downloaded from an Internet source.

Also note that even with broadcast sources, the transmission of supplemental data files does not have to take place concurrently with transmission of video streams. Rather, in some systems it might be desirable to broadcast overlay files during the night to user equipment, for use the following day. Control data indicates which programming the overlay files are to be associated with, and software at the user's PC retrieves the appropriate files at the appropriate times depending on the viewing selections of the user.

The invention provides an easy way for broadcasters and other video providers to supply supplemental textual and graphical materials, and to have such materials coordinated with video content. In contrast to prior systems, the invention takes advantage of widely-used hypertext authoring packages, as thus encouraging acceptance and standardization

In compliance with the statute, the invention has been described in language more or less specific as to structural and methodical features. It is to be understood, however, that the invention is not limited to the specific features described, since the means herein disclosed comprise preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or

modifications within the proper scope of the appended claims appropriately interpreted in accordance with the doctrine of equivalents.

CLAIMS

1. A method comprising the following steps:

transmitting a video stream;

formatting supplemental data files in a graphical markup language, each supplemental data file having instructions for rendering a hyperlink overlay on the video stream;

transmitting the supplemental data files along with the video stream.

2. A method as recited in claim 1 wherein the formatting step comprises formatting the supplemental data files in HTML.

3. A method as recited in claim 1 and further comprising a step of transmitting timing specifications with the supplemental data files indicating times for displaying the hyperlink overlays.

4. A computer-readable storage medium having computer-executable instructions for performing steps as recited in claim 1.

5. A method as recited in claim 1 and further comprising the following additional steps:

receiving the video stream and accompanying supplemental data files;

displaying the hyperlink overlays in conjunction with the video stream.

6. A method as recited in claim 5, wherein the displaying step comprises launching an HTML-compatible browser to display the hyperlink overlays.

7. A method as recited in claim 5, wherein:

the formatting step comprises setting transparent areas of each hyperlink overlay to a key color;

the displaying step comprises displaying the video stream only in the areas of the hyperlink overlays that are set to a key color.

8. A method as recited in claim 5, wherein:

the formatting step comprises setting transparent areas of each hyperlink overlay to a key color;

the displaying step comprises launching an HTML-compatible browser to display the hyperlink overlays;

the displaying step further comprises displaying the video stream only in the areas of the hyperlink overlays that are set to a key color.

9. A method as recited in claim 5, wherein:

the formatting step comprises setting transparent areas of the hyperlink overlay to a key color;

the displaying step comprises displaying the hyperlink overlay and using color keying video hardware that displays video only in display areas that are set to a key color.

10. A method as recited in claim 5, wherein:

the formatting step comprises setting transparent areas of the hyperlink overlay to a key color;

the displaying step comprises launching an HTML-compatible browser to display the hyperlink overlays;

the displaying step further comprises using color keying video hardware that displays video only in display areas that are set to a key color.

11. A method as recited in claim 5, wherein the formatting step comprises including hyperlinks in the hyperlink overlays, the method further comprising an additional step of displaying content targeted by such hyperlinks in response to selecting such hyperlinks.

12. A method as recited in claim 5, wherein the formatting step comprises including hyperlinks in the hyperlink overlays, the method further comprising an additional step of replacing any currently displayed hyperlink overlay with content targeted by such hyperlinks in response to selecting such hyperlinks.

13. A method as recited in claim 5, wherein the formatting step comprises including hyperlinks in the hyperlink overlays, the method further comprising an additional step of opening new viewing windows for displaying content targeted by such hyperlinks.

14. A method as recited in claim 5, wherein the formatting step comprises including hyperlinks in the hyperlink overlays, the method further comprising an additional step of launching application programs as required to render content targeted by such hyperlinks.

15. A computer-readable storage medium having computer-executable instructions for performing steps as recited in claim 5.

16. A method comprising the following steps:

transmitting a video stream;

formatting HTML files having instructions for rendering hyperlink pages, the hyperlink pages having transparent areas that are set to a key color;

associating the HTML files with the video stream;

displaying the hyperlink pages on a display;

displaying the video stream on the display in areas of displayed hyperlink pages that are set to a key color.

17. A method as recited in claim 16, and further comprising the following additional steps:

transmitting timing specifications with the HTML files indicating times for displaying the hyperlink pages;

the step of displaying the hyperlink pages being performed at the times indicated by the timing specifications.

18. A method as recited in claim 16, wherein the step of displaying the hyperlink pages comprises launching an HTML-compatible browser.

19. A method as recited in claim 16, wherein the step of displaying the video stream comprises using color keying video hardware that displays video only in display areas that are set to a key color.

20. A method as recited in claim 16, further comprising an additional step of displaying content targeted by hyperlinks in response to selecting such hyperlinks.

21. A method as recited in claim 16, further comprising an additional step of replacing any currently displayed hyperlink pages with content targeted by hyperlinks in response to selecting such hyperlinks.

22. A method as recited in claim 16, the method further comprising an additional step of opening new viewing windows for displaying content targeted by hyperlinks in displayed hyperlink pages.

23. A method as recited in claim 16, further comprising an additional step of launching application programs as required to render content targeted by hyperlinks in displayed hyperlink pages.

24. A method comprising the following steps:

receiving a video stream;

associating one or more hyperlink pages with the video stream, the hyperlink pages having transparent areas that are set to a key color;

displaying the hyperlink pages on a display;

displaying the video stream on the display in areas of displayed hyperlink pages that are set to a key color.

25. A method as recited in claim 24, wherein the step of displaying the hyperlink pages comprises launching an HTML-compatible browser.

26. A method as recited in claim 24, wherein the step of displaying the video stream comprises using color keying video hardware that is configured to display video only in display areas that are set to a key color.

27. A method as recited in claim 24, wherein:

the step of displaying the hyperlink pages comprises launching an HTML-compatible browser;

the step of displaying the video stream comprises using color keying video hardware that is configured to display video only in display areas that are set to a key color.

28. A method as recited in claim 24, further comprising an additional step of displaying content targeted by hyperlinks in response to selecting such hyperlinks.

29. A method as recited in claim 24, further comprising an additional step of replacing any currently displayed hyperlink pages with content targeted by hyperlinks in response to selecting such hyperlinks.

30. A method as recited in claim 24, the method further comprising an additional step of opening new viewing windows for displaying content targeted by hyperlinks in displayed hyperlink pages.

31. A method as recited in claim 24, further comprising an additional step of launching application programs as required to render content targeted by hyperlinks in displayed hyperlink pages.

32. A computer-readable storage medium having computer-executable instructions for performing steps comprising:

receiving a video stream;

associating one or more hyperlink pages with the video stream, the hyperlink pages having transparent areas that are set to a key color;

displaying the hyperlink pages on a display;

displaying the video stream on the display in areas of displayed hyperlink pages that are set to a key color.

33. A computer-readable storage medium as recited in claim 32, wherein the step of displaying the hyperlink pages comprises launching an HTML-compatible browser.

34. A computer-readable storage medium as recited in claim 32, wherein the step of displaying the video stream comprises using color keying video hardware that is configured to display video only in display areas that are set to a key color.

35. A computer-readable storage medium as recited in claim 32, wherein:

the step of displaying the hyperlink pages comprises launching an HTML-compatible browser;

the step of displaying the video stream comprises using color keying video hardware that is configured to display video only in display areas that are set to a key color.

36. A computer-readable storage medium as recited in claim 32 having further computer-executable instructions for performing the additional step of displaying content targeted by hyperlinks in response to selecting such hyperlinks.

37. A computer-readable storage medium as recited in claim 32, having further computer-executable instructions for performing the additional step of replacing any currently displayed hyperlink pages with content targeted by hyperlinks in response to selecting such hyperlinks.

38. A computer-readable storage medium as recited in claim 32, having further computer-executable instructions for performing the additional step of opening new viewing windows for displaying content targeted by hyperlinks in displayed hyperlink pages.

39. A computer-readable storage medium as recited in claim 32, having further computer-executable instructions for performing the additional step of launching application programs as required to render content targeted by hyperlinks in displayed hyperlink pages.

40. A video broadcast system comprising:

a broadcast source that broadcasts a video stream and provides accompanying supplemental data files, each supplemental data file having instructions for rendering a hyperlink overlay on the video stream;

a receiver configured to receive the video stream and accompanying supplemental data files and to display the hyperlink overlays in conjunction with the video stream.

41. A video broadcast system as recited in claim 40, wherein the supplemental data files are formatted in HTML.

42. A video broadcast system as recited in claim 40, wherein the broadcast source provides timing specifications with the supplemental data files indicating times for displaying the hyperlink overlays relative to the video stream.

43. A video broadcast system as recited in claim 40, further comprising an HTML-compatible browser that the receiver launches to display the hyperlink overlays.

44. A video broadcast system as recited in claim 40, wherein the receiver comprises color keying hardware that displays video only in display areas that are set to a key color, the hyperlink overlays having transparent areas that are set to a key color.

45. A receiver for receiving and displaying video streams, comprising:

display hardware for displaying video streams and bit-mapped images to a user;

the display hardware including color keying hardware that displays video in display areas that are set to a key color;

access means for reading supplemental data files that have instructions for rendering bit-mapped hyperlink overlays in conjunction with the video stream at indicated times;

a data processor that reads the supplemental data files and in response displays the hyperlink overlays at the indicated times, wherein the hyperlink overlays have transparent areas that are set to a key color, the hyperlink overlays thus appearing to overlay the video streams.

46. A receiver as recited in claim 45, further comprising an HTML-compatible browser that the data processor executes to display the hyperlink overlays.

47. A receiver as recited in claim 45, wherein the data processor is programmed to display content targeted by hyperlinks in the hyperlink overlays in response to selecting such hyperlinks.

48. A receiver as recited in claim 45, wherein the data processor is programmed to replace any currently displayed hyperlink overlay with content targeted by a hyperlink in said currently displayed hyperlink overlay in response to selecting such hyperlink.

49. A receiver as recited in claim 45, wherein the data processor is programmed to open a new viewing window for displaying content targeted by a particular hyperlink in response to selecting the particular hyperlink.

50. A receiver as recited in claim 45, wherein the data processor is programmed to launch application programs as required to render content targeted by hyperlinks in hyperlink overlays.

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Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2 309 134 A [Concept Dev.] See abstract	1, 16, 24, 40, 45

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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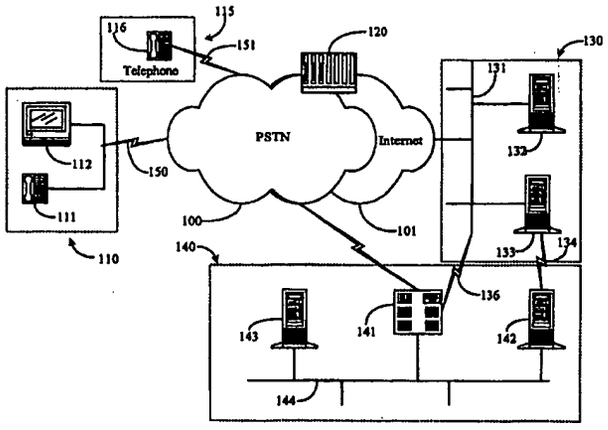

(57) Abstract

An Internet system for providing call–back services for a subscriber includes a web page having a call–back link to a subscription server; a call–back application operating on the subscription server and adapted for accepting input from a browsing person linked to the subscription server by the call–back link; and a call–switching system connected to and responsive to the call–back application on the subscription server. In this system the browsing person, upon activating the call–back link, is linked to the call–back application on the subscription server and prompted for input including a call–back number, and the subscription server, after accepting the input, directs the call–switching system in establishing a telephony link between the subscriber and the browsing person. In some instances the telephony switch is part of a call–center with connected agents, and agents are assigned to represent selected subscribers. In this instance call–back connection is made between a browsing person and an agent. In some embodiments connections can be made either by conventional telephony links or by Internet telephone. In some instances as well provision is made for delivery of a full range of multi–media services from a subscriber to a browsing person.

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Method and Apparatus for Automatic Network Connection Between a Small Business and a Client

by Inventor
Yuri Shtivelman

Field of the Invention

The present invention is in the field of Internet network-communication systems and has particular application to methods and apparatus for the direct linking of an individual to a small business via automatic linking from a Web page.

Background of the Invention

Continued development of hardware and software applications to aid in business advertisement, coupled with explosive growth of the global network called the Internet, has motivated small businesses to maintain at least one computer that is dedicated to the purpose of advertising that business's products and services on-line. There are, at the present time, many small businesses who are advertising their products and services on the Internet. Many such small ventures are very limited in capital and must be very cautious about where they invest their money, especially, when it comes to advertisement, and most utilize various services provided by second parties for founding and maintaining a WEB page, such as an Internet Service Provider.

Larger companies and corporations, having much larger budgets dedicated to advertising, use the Internet and their own on-premises networking-telephony equipment to set up their own interactive on-line environments. By clicking an icon on a Web page, a customer can become connected to a private company sales and service network, receive goods and services, pay via Internet-secure transfer

applications, and so on. Often, these corporate giants provide multi-media files such as surround-video shows of products, on-line catalogs, audio/video files, and the like. Typically, a potential customer can download such files to his or her PC or watch them on the Web page via an external viewer designed for that purpose. In some cases, the customer can enter his or her phone number and ask for a scheduled or immediate callback.

As Web page advertising via the Internet is still under some scrutiny as to whether or not it is generally profitable, many of the larger businesses are taking a wait and see approach while keeping with a simpler form of Web page advertisement wherein a customer can click an icon and receive a call back or a mailing at a later date. Even for a large business with sufficient capital, setting up a telephony-network for providing multi-media advertising is no casual undertaking. There are many variables to be considered when making such advertising decisions. One important consideration would be whether or not the market demographics of the target customer group would fit an Internet profile. For example, if the product or service can only be sold or performed locally, or within a certain geographical radius, it will not pay to invest in global exposure. If the target customer group is low in the percentage of persons having Internet access, it may not pay to advertise on-line. However, if the product or service is of a type as to be provided through mail order, or through some other criteria, appeals to a mass customer base, then setting up a private network system may be the way to go. As well, large companies feeling the pressure from like competitors who have their own networks are often drawn into the muti-media advertising game and set up similar networks so as not to be left behind.

There are at the time of this application many small companies which may include home-based businesses that offer products or services that appeal to mass customer groups. However, due to limited capital, these companies cannot afford to purchase sophisticated telephony equipment such as file servers, routers, computers or other such apparatus that may be required to set up a private service network. A good many of these small organizations would love to grow beyond

the infant stage and become major players in their fields, however, money constraints often severely limit the amount and quality of exposure that such a small business would receive through advertising. Typically, if these companies advertise on the Internet they may have only one Web page with a brief description of their products and services followed by an E-mail address and phone number where they can be reached. Interactive advertisements wherein multiple Web pages are maintained and network connections can be made, are generally reserved for businesses with more money to invest. The smaller organizations also typically turn to ISPs or other providers for maintaining a WEB page.

Through the growth of the Internet and the ability to network with other small businesses, many owners of small businesses have managed to obtain links on the Web pages of non-competitive business associates resulting in multiple links to their single Web page. While this may improve access to their particular Web page, it does not provide for the scope of sales and service capabilities afforded by a much larger corporation maintaining several Web pages and supporting a connectable service-network.

What is clearly needed is a method and apparatus whereby a small business, such as a home-based business, could have a direct network-connection with their potential clients wherein real-time interface and multi-media response to potential customers could be provided in a flexible manner and at a relatively low cost to the business owner. Such capability could be provided to the small business as a service by the Internet Service Provider (ISP) or by yet another party. In embodiments of the invention taught below, such a service is referred to as 'Green Pages'.

Summary of the Invention

In a preferred embodiment of the present invention an Internet system for providing call-back services for a subscriber is provided, comprising a subscription call-back server adapted for accepting input from a browsing person linked to the call-back server; a web page having a jump link to the subscription call-back server; and a call-switching system connected to and responsive to the call-back server. In this system the browsing person, upon activating the WEB page jump link, is linked to the call-back server and prompted for input including a call-back number, and the call-back server, after accepting the input, directs the call-switching system in establishing a telephony link between the subscriber and the browsing person.

In a preferred embodiment the call-switching system comprises a telephony server (T-Server) connected to a telephony switch by a computer-telephony integration (CTI) link, and the T-Server is adapted to accept directions from the call-back server and to direct the telephony switch in establishing the telephony link between the subscriber and the browsing person. The call-back server in some aspects accepts one or both of a telephone number and an IP address or e-mail address from the browsing person, the telephony switch has an Internet-capable port, and the T-Server, in response to input from the call-back server establishes one or both of a telephone link and an Internet link between the subscriber and the browsing person.

In some embodiments the system further comprises an IVR server connected to the telephony switch an adapted to provide IVR services over the connection provided by the call-switching system. Also in some the call-back server is adapted to accept instructions from a browsing person including a range of multi-media services.

In an alternative embodiment of the invention the system comprises a call-center operable through the telephony switch under control of the T-Server, the call-center comprising agent stations having each a personal computer with a video display unit (PC/VDU) connected on a Local Area Network (LAN) to the T-Server, and a telephone connected to the telephony switch, wherein the T-Server,

in response to input from the call-back server is adapted to establish connections between browsing persons and connected agents, and to present data elicited from browsing persons on the VDUs at the agent stations.

In another aspect of the invention a subscription call-center is provided, comprising a telephony switch having a telephone trunk line connection to a public switched telephony network (PSTN); a plurality of agent stations connected to the telephony switch; and a CTI Server (T-Server) connected to the telephony switch by a CTI link, the T-Server having a digital link to an Internet-connected call-back server. The call-back server stores subscriber information and accepts input from browsing persons seeking connection to agents for the subscribers, and the call-back server, directed by a browsing person providing a call-back number, directs the T-Server to command the telephony switch to establish a telephony connection between the browsing person and an agent for the subscriber.

In some embodiments the subscription call-center further comprises a personal computer with a video display unit (PC/VDU) at each agent station, the PC/VDUs interconnected on a local area network (LAN) with the T-Server. In some of these embodiments the telephony switch has an Internet-capable port as well as a telephony trunk line, and the call-back server accepts IP addresses, e-mail addresses as well as telephone numbers from browsing persons, and the T-Server is adapted to cause the telephony switch to establish one or both of conventional telephony calls and Internet telephone calls between agents and browsing persons.

The embodiments of the invention, taught in further detail below, provide an ability for small businesses, such as home-based businesses, to flexibly provide for call-back services initiated from WEB page hits. Further, in some aspects, small businesses can now employ agents at a call-back call-center to represent their business interests, and enter into sales and commission agreements with the agents. Further, the subscribing small businesses can adjust their agent participation as need dictates. Detail of embodiments providing all of these features are taught below

Brief Description of the Drawing Figures

Fig. 1 is an simplified overview of a telephony-network system in accordance with an embodiment of the present invention.

Fig. 2 is a simplified overview of a call center in accordance with an alternative embodiment of the present invention.

Fig. 3 is an illustrative view of interactive-routing software as used in accordance with the embodiment shown in Fig. 2.

Description of the Preferred Embodiments

Fig. 1 is a simplified overview of a telephony-network system in accordance with an embodiment of the present invention wherein a potential customer can have real-time on-line access to a small business advertising on the Internet. In a preferred embodiment of the present invention, a small business 115 having a WEB page hosted by a third party, such as his Internet Service Provider (ISP), would subscribe to a unique service that may be provided by his ISP or yet another provider. Through this service, a telephony-network system is made available to potential customers for the purpose of direct linking to small business 115 in real-time and with multi-media capabilities.

In Fig. 1, premises 110 represents any of potential customer's PC 112 and a telephone 111, which may be connected to the same telephone line as shown, or, alternatively, may have dedicated telephone lines. Telephone 111 for example, may have an analog line and PC 112 an ISDN line. PC 112 has the capability (equipment and software) of accessing the Internet by way of connection 150 to a Public Switched Telephone Network (PSTN) 100. Modem bank 120 represents the potential customer's ISP, which connects the potential customer's computer

112 to Internet domain 101. It will be clear to those with skill in the art that multiple potential customers will have different ISPs and so forth, but one such connection is sufficient to illustrate embodiments of the present invention.

As a potential customer browses Internet Web sites, he may come across the Web page of small business 115 which, in this embodiment, is located on a Web server 132, co-hosted by an ISP 130. It is not required that the small-business WEB page be provided by his/her ISP. It could reside anywhere in the Internet cloud that supports WEB pages. The ISP illustration is convenient. In various embodiments of the present invention, businesses subscribing to the unique Green Pages service of the present invention have a link incorporated in the WEB page to link browsing parties to a Green Pages server 133. The link can be in any of the forms known in the art for jumping from a WEB page to another Internet destination, such as clicking on an icon or text message. Typically, placing the cursor in the display on an active link area produces a change in the cursor, such as a pointing finger, indicating clicking a mouse button will activate a link (jump).

The Green Pages service may be provided, as shown, on a separate server at the small business' ISP, at another server elsewhere on the Internet, or may even be a part of the server that hosts the small business home page. It will be apparent to the skilled artisan that the residence of software and execution relative to platforms is somewhat arbitrary, and can be accomplished in a number of ways.

Once the potential customer is transferred to Green Pages server 133 in this particular embodiment, control routines on that server associate the potential customer with the small business whose WEB page the potential customer was viewing, and wherein the link was initiated. At server 133 the potential customer is presented with an input display, such as an inquiry form, to input specific information, such as the customer's telephone number, the type of connection desired, and so forth. For example, the customer may wish to speak with an agent immediately by telephone, but may not want to be E-mailed and so on. Other information, such as name, address, etc., may be required or optional.

Once the potential customer's input is made, which may be as simple as just a phone number, a submit input initiates action of the response system to the potential customer according to the instructions and data input. In this particular embodiment a link 134 is opened to a processor 142 executing a CTI application, termed by the inventors as a T-Server. Although in a stricter sense, the application is known as a T-Server, and may execute on various processors, it is simpler and more direct to refer to the platform and application together as the T-Server, which convention is followed below. T-Server 142 may be, as shown, a part of a separate hardware grouping 140, wherein T-Server 142 is linked by a CTI connection 144 to a telephony switch 141 and to an IVR server 143. Again, it will be apparent to the skilled artisan that T-Server 142, switch 141, and IVR 143 may be a part of a grouping as shown, may be hosted by ISP 120 or by any other interested party receiving compensation for maintaining the equipment. In one embodiment, equipment grouping 140 may be maintained by a telephone company which provides the service for a small charge on the small business' telephone bill. There are many other ways the functionality taught herein may be implemented.

Referring back to Fig. 1, T-Server 142 in an embodiment of the present invention has a connection 144 to a telephony switch 141 for the purpose of initiating calls to small businesses such as small business 115 and to potential customers requesting a telephone connection. As is known in the art, CTI servers may monitor and control operations of telephony switches by CTI link within the range of functionality provided by individual such telephony switches. T-Server 142, following instructions from server 133, initiates and completes these connections. For example, T-Server 142 may control switch 141 to initiate a call through PSTN 100 to telephone 116 at small business 115 and to the potential customer's premises 110 to telephone 112, and then, upon establishing the two calls, connect them, completing the link from the customer to the small business.

Small business 115 and the customer at premises 110 can be linked via telephone and in other ways as well. For example, also linked to telephony switch

via line 144 is an IVR server 143 where additional applications may be stored such as voice mail, E-mail, Automatic Fax messages, etc. For example, if the customer has input instructions to Green Pages server 133 indicating a preference to receive information by fax, then IVR server 143 would be accessed and the customer could be sent pre-stored information by facsimile.

In yet another embodiment, IVR server 143 can be used to provide a front end to the small business owner by giving him/her options for treating the communications request. For example, the business owner might choose to accept the call, to reject a call, to schedule a callback, or to ask the customer to leave a message or send an email.

If switch 141 has a TCP/IP connection capability and link 136, as in the present example, one option for the potential customer is to be connected by Internet phone. In this instance the potential customer will have provided an IP address. Switch 141 may then establish a connection to the potential customer via link 136 through ISP 130. Instant communication could be established for customers indicating a preference for Internet-capable telephones, as described above. Similarly, there are certain WEB applications and or plug-ins to WEB browsers capable of transferring files in instant fashion that are known in the art and could be incorporated by a small business to send files to a customer having a compatible application. These mediums for communication are known in the art and could be incorporated into the service and installed on a PC located at a small business. All that would be required of the customer is that he have the matching or compatible type of communication program installed on PC 112.

Link server 133, as previously described, would list the communication programs available to the customer and offer a choice of preferred methods. It will be apparent to one with skill in the art that each server in the network of Fig. 1 is not required to perform only one dedicated function such as severs 132, 133, and 142 of Fig. 1, but can be set up to perform multi-functions such as storing customer histories or providing statistics related to success of the service provided, etc. Similarly, separate servers 132, 133, and 142 may be of the form of one

server capable of storing and providing all the necessary information and software to enable the desired network connection. However, in this instant embodiment, the inventor has chosen to represent the server function of the present invention with separate servers for the purpose of clarity with regards to describing sever function.

The embodiment represented in Fig. 1 is unique partly by virtue of the fact that customers can be given the choice of several different real-time multimedia-communication methods that are known in the art and made available in the form of software applications stored on a server connected to a PC, or on a PC installed at a small business such as small business 115 that is made accessible to the customer via automatic-linking methods and software. Upon filling out a form and submitting the information, as described above, an online environment in the form of a sales/service network is made available to the small business for a reasonable monthly subscription.

In one embodiment, a small business wishing to offer the customer a wide variety of communication options as well as multimedia files for download may invest in a file server for the purpose of storing such files and applications. A sever such as this could be installed at the small business location and connected to a PC also installed at the small business and dedicated to interaction with customers requesting such information and communication.

In the embodiment of the invention above-described, a small business, such as a home business with very limited personnel and equipment resources, can have call-back service through a WEB page much as is provided by large companies through their own equipment platforms. There are, however some potential limitations in the above-described embodiments of the invention. For example, the WEB advertising and call-back service provided may well be successful enough to create a significant call load for a small business. For a truly small business, such as a one or two-person home business, a manpower shortage could quickly appear, there being more call-back business than the limited personnel can handle. Further, many people WEB browsing are doing so in

evening and weekend hours. This may place an additional burden on a small business.

In recognition of the above possible difficulties, in an alternate embodiment of the present invention, an agent call-center is provided wherein independent sales agents represent subscriber businesses, and are trained as to the specific products and services offered by each business. This rent-an-agent call center can be implemented in a number of ways, and in a preferred embodiment is implemented as a part of equipment group 140 of Fig. 1. In this embodiment, the purpose of having a call-center is that many small businesses do not have the manpower to handle multiple-live calls that may result from many potential customers browsing their pages and attempting to link. As well, many customers are browsing for products or services after normal business hours such as from 6 PM on during the week, or perhaps, on a Sunday. The advantage here is that "the store is always open, and someone is there to help you".

Fig. 2 is a diagram of an agent call-center in an alternative embodiment of the present invention wherein the telephony-network of Fig. 1 is enhanced with a live call-center comprising specially trained agents and associated equipment, including software, to be operated and maintained by a hosting organization, such as an ISP, perhaps the ISP of the small business and providing the Green Pages service. There may be a large number of small businesses subscribing to the service above-described wherein the unique telephony-network of Fig. 1 is provided.

Referring now to Fig. 2, agent station 149 and agent station 151 are part of equipment grouping 140 that now functions as a call center in this instant embodiment of the present invention. Of course the call center might be anywhere in the network, and calls might be forwarded to one or more call center in fashion well-known to the inventor. Agent station 149 has a PC with a video display unit (PC/VDU) 153 as well as a telephone 157. Similarly, agent station 151 has a PC/VDU 155 and telephone 159. Telephones 157 and 159 are linked to telephony switch 141 via line 161 and to their associated PC/VDU's. PC/VDU's 153 and

155 are interconnected on a Local Are Network (LAN) 163 which also connects to IVR server 143 and to T-Server 142. The other connection shown are those previously described with reference to Fig. 1.

It will be apparent to one with skill in the art that there could be many more than the two agent stations shown, however two are shown in this instant embodiment and are deemed sufficient by the inventor to adequately describe the invention. In this instant embodiment, IVR server 143, as well as T-server 142 contain instances of a unique interactive-routing software designed to enable agents to process and dispose of incoming data and instructions from Green Pages server 133.

In this embodiment, when a potential customer connects to Green Pages server 133 and inputs data and requests, server 133 via link 134 activates routines in T-Server 142. Now, instead of placing a call to the small business and the potential customer, then connecting the two calls, the T-Server forwards the customer input data to an agent listed as serving the particular small business, calls the potential customer, and connects the potential customer with the agent selected.

There are, as will be apparent to the skilled artisan, many ways the information sent may be displayed to an agent, such as in the form of icons to be displayed on PC/VDU's 149 and 151. For example, after requested methods for communication to a particular business are chosen by a potential customer on the associated inquiry form in link server 133 of Fig. 1, completed inquiry forms may be routed to a particular agent station assigned to the small business that has been selected by the customer, such as agent station 149. This information includes the method of communication chosen by the customer along with the small business information associated with it such as a locator number for the business in a roster of the agent receiving the information, requested time for a connection, additional information such as the specific type of product the customer is interested in, and so on. In a case such as this, where a real-time telephone connection has not been requested, the agent at agent station 149 could re-route the customer to IVR server

143 where the customer could leave voice mail, download product information, or receive an instant fax, etc. In alternative embodiments routing may be directly to server 143 or similar server, and operation would be more automatic, as already described in previous embodiments above.

As described in the previous paragraph, incoming data from link server 133 of Fig. 1 is routed to the particular agent with that business on his roster. For example, an inquiry form requesting immediate telephone access to small business 115 of Fig. 1 has been routed to agent station 151 in the form of an icon indicating an incoming telephone call. Switch 141 has made telephone contact with the customer and is queuing the customer until the agent at station 151 picks up the call. Once connected via phone, the agent may direct the customer to further services or take an order, etc. Connections to IVR server 143 can also be initiated by the agent. Multimedia files and other information requested by a customer is sent via line 144 through telephony switch 141 and through link 136 to the customers PC such as PC 112 of Fig. 1. As described above, applications that are interactive such as video, audio and the like can be sent with the agent helping the customer to pick the appropriate file type etc. Furthermore, Internet telephone applications could be initiated with the customer and agent saving toll charges and so on. Similarly, there are Internet file transfer programs available whereby the customer could be sent files by an agent using the same program in an almost instant fashion. On-line secure payment methods may also be utilized in this environment.

It will be apparent to those with skill in the art that other routes could be utilized for the purposes of transferring data from the agent call-center to the customer other than the one described in the above paragraph with reference to multimedia files. One possible route is through line 144, telephony switch 141, through line 136 and back via Internet domain 101 of Fig. 1. There are typically many such routes available in an Internet-connected telephony network. Similarly, subscriber businesses may be located state-wide, nation-wide, or world-wide depending upon the intent of the service provider that offers the service

An agent operating in an enhanced telephony-network such as the one described in this instant embodiment could perhaps derive a small commission from any sales orders made in this manner to be payable by the particular business associated with that particular sale. If no sales are made, no commission is due. The monthly amount paid to the service provider in this case supports the basic service, and may even provide a base salary for such agents. Commission sales representatives are known in the art and can obtain licenses to represent numerous companies from a separate location. In this instant embodiment, particulars such as commission structures and the like are worked out by the participating parties.

The embodiment represented in Fig. 2 is unique partly by virtue of the fact that customers can be given the choice of several different real-time multimedia-communication methods that are known in the art and made available in the form of software applications on a server that is made accessible to the customer via automatic linking methods. Further, in the same embodiment, connection can also be made to a live agent utilizing a unique application adapted to enhance the disposition of incoming requests in an environment that is a functioning on-line telephony-network and is made available to a small business for a reasonable monthly subscription.

As this instant embodiment with reference to Fig. 2 is meant to enhance the previously described embodiments of Fig. 1, it will be apparent to one with skill in the art that while a call-center such as the one described herein may be present and operating in the network, it is not required to be operating at all times. There are many configurations and schemes that could be employed in a network that is enhanced by such a call-center. For example, a small business could be given the choice of the extra service provided by the call-center, and be charged appropriately for the service. In another embodiment, the call-center could become operative only after normal business hours, or at times when businesses are normally closed such as weekends, etc. In still another embodiment a call-enter enhancement may be offered to those businesses that cannot handle the volume of inquiries such as might be the case with a home-based business wherein

only a few individuals are present at any given time. There are many such configurations possible, many of which have already been described.

Another feature and advantage of the call-center embodiments described herein is that the service is flexible for changing needs. Many small business subscribers will not initially need the call-center enhancement. As business grows a business may need to add the call-center enhancement with a single agent, even part-time. As business grows further, more agent service may be incrementally added. If business slacks off at certain times or seasons, agent use can be curtailed appropriately.

Fig. 3 is an example of an interactive display provided by routing software as it is used in accordance with the call-center-enhanced embodiment of the present invention described with reference and illustration in Fig. 2, wherein a scrollable interactive window display 301 is present on a PC/VDU such as PC/VDU 153 in agent station 149 of Fig. 2. Various selectable icons represent different applications that may be manipulated by an agent to dispose of an incoming request. For example, incoming calls are represented by an icon 303 which further indicates that there are 2 such calls in a waiting queue. An icon 305 represents a call that has been put on hold by the agent after it was answered. Icon 307 is a call in session whereby the agent is engaged in servicing the customer. Icons representing incoming calls have, in this embodiment, come from link server 133 as customers requesting immediate telephone connection. Requests for communication other than by telephone such as leaving voicemail, obtaining downloadable files and so on are represented by other icons (not shown) depicting the type of communication desired. This incoming data can be re-routed to IVR server 143 of Fig. 2, or in some embodiments, may by-pass the agent altogether.

Icon 309 represents an instance of an Internet-capable phone application installed either on IVR server 143 of Fig. 2 and accessible to the agent, or on PC/VDU 153 whereby a customer can elect to be phoned back without toll charges provided the customer has the required software installed on PC 112 of Fig. 1. An agent roster 311 is a list of all of the small businesses that are

represented by this particular agent. By clicking on agent roster 311, the agent opens the list of small businesses and can then click on the appropriate business that the customer is requesting information about. After clicking on agent roster 311, associated information files are opened and displayed in window 301 such as an icon 315 representing the stored multimedia files for download, and an icon 317 representing text information for download. These files could be sent to the customer a number of ways. For example, a file server system represented by an icon 313 could be utilized by the agent to link the customer having the same application or compatible application for the purposes of downloading the files in expedient fashion. These programs are faster than E-mail and often faster than a download from a standard Web page. As well, many of these programs can operate simultaneously while the customer is still browsing the Internet or working on a document, while at the same time, using an Internet-capable phone and downloading files with a file-server application. Icons 319 and 321 represent standard communication options. Icon 323 represents agent identification and can be used to tag sales orders and the like.

It will be apparent to those with skill in the art that the configuration of an interactive-routing software as described above can be accomplished in a number of ways. The interface, for example, may be a Graphic User Interface (GUI) wherein icons may be used to represent calls, applications, and other incoming requests, and the individual agent at one agent station may select to display icons as desired and as shown in Fig. 3. In an alternative embodiment an incoming request may appear on an agent's PC/VDU as a text block with the text indicating the nature of the incoming request. In this instance programmable language could be used to further dispose of requests. It will further be apparent to one with skill in the art that features such as drag and drop capabilities could be incorporated in the software and utilized by agents to initiate certain actions such as connecting a customer to IDN server 143 of Fig. 2, or perhaps dropping a file onto the customers name in the file server system 313 for transfer and so on.

It will be apparent to one with skill in the art that there could be many different hardware and software configurations present in a telephony-network such as the one described in the various embodiments above without departing from the spirit and scope of the present invention. For example, other servers could be present along with additional processors running conventional routing software designed to route information at locations other than in portions of the network that may be maintained by an ISP or other interested party. The hosting service provider may have sharing arrangements with other networks already in place and may make minor alterations to tailor the specific network to meet it's intended service objectives such as adding servers, installing firewalls and so on. There are many different possibilities, many of which have already been described above. The invention is limited only by the claims which follow.

One of the options described above is that a potential customer may prefer to be contacted by Internet phone, and would provide an IP address. It should therefore be apparent to the skilled artisan that there are options available in practicing the invention in use of conventional intelligent network telephony or Internet (or Intranet) telephony for various calls to be placed. The invention is not limited to one type of telephony system or service.

What is claimed is:

1. An Internet system for providing call-back services for a subscriber, comprising:

a subscription call-back server adapted for accepting input from a browsing person linked to the call-back server;

a web page having a jump link to the subscription call-back server; and

a call-switching system connected to and responsive to the call-back server;

wherein the browsing person, upon activating the WEB page jump link, is linked to the call back server and prompted for input including a call-back number, and the call-back server, after accepting the input, directs the call-switching system in establishing a telephony link between the subscriber and the browsing person.

2. The system of claim 1 wherein the call-switching system comprises a telephony server (T-Server) connected to a telephony switch by a computer-telephony integration (CTI) link, and the T-Server is adapted to accept directions from the call-back server and to direct the telephony switch in establishing the telephony link between the subscriber and the browsing person.

3. The system of claim 2 wherein the call-back server accepts one or both of a telephone number and an IP address from the browsing person, the telephony switch has an Internet-capable port, and the T-Server, in response to input from the call-back server establishes one or both of a telephone link and an Internet link between the subscriber and the browsing person.

4. The system of claim 2 further comprising an IVR server connected to the telephony switch an adapted to provide IVR services over the connection provided by the call-switching system.

5. The system of claim 1 wherein the call-back server is adapted to accept instructions from a browsing person including a range of multi-media services.

6. The system of claim 4 wherein the IVR server is adapted to provide to the subscriber a range of call disposition options.

7. The system of claim 1 further comprising a call-center operable through the telephony switch under control of the T-Server, the call-center comprising agent stations having each a personal computer with a video display unit (PC/VDU) connected on a Local Area Network (LAN) to the T-Server, and a telephone connected to the telephony switch, wherein the T-Server, in response to input from the call-back server is adapted to establish connections between browsing persons and connected agents, and to present data elicited from browsing persons on the VDUs at the agent stations.

8. A subscription call-center, comprising:

a telephony switch having a telephone trunk line connection to a public switched telephony network (PSTN);

a plurality of agent stations connected to the telephony switch; and

a CTI Server (T-Server) connected to the telephony switch by a CTI link, the T-Server having a digital link to an Internet-connected call-back server;

wherein the call-back server stores subscriber information and accepts input from browsing persons seeking connection to agents for the subscribers, and the call-back server, directed by a browsing person providing a call-back number, directs the T-Server to command the telephony switch to establish a telephony connection between the browsing person and an agent for the subscriber.

9. The call-center of claim 8 further comprising a personal computer with a video display unit (PC/VDU) at each agent station, the PC/VDUs interconnected on a local area network (LAN) with the T-Server.

10. The subscription call-center of claim 9 wherein the telephony switch has an Internet-capable port as well as a telephony trunk line, and the call-back server accepts IP addresses as well as telephone numbers from browsing persons, and wherein the T-Server is adapted to cause the telephony switch to establish one or both of conventional telephony calls and Internet telephone calls between agents and browsing persons.

11. A method for providing call-back services to a browsing person on the Internet from a subscribers to a call-back service, comprising steps of:

(a) providing a link in the subscriber's WEB page to a call-back server;

(b) providing an input mechanism for browsing persons linked to the call-back server to input at least a call-back number;

(c) activating a CTI Server (T-Server) connected to a telephony switch having a telephony trunk line from the call-back server to establish a telephony connection between the browsing person and the subscriber.

12. The method of claim 11 wherein in step (b) the input mechanism elicits preferences from a browsing person for a range of available multi-media services associated with the subscriber, and the call-back server presents a script to the T-Server for providing the services according to the elicited preferences.

13. The method of claim 11 wherein the telephony switch has connected agent stations, and in step (c) the telephony connection is established between the browsing person and an agent associated with the subscriber.

14. The method of claim 11 wherein the telephony switch is Internet-capable, and wherein the connection between a browsing person and a subscriber is an Internet telephone connection.

15. The method of claim 13 wherein the telephony switch is Internet-capable, and wherein the connection between a browsing person and an agent is an Internet telephone connection.

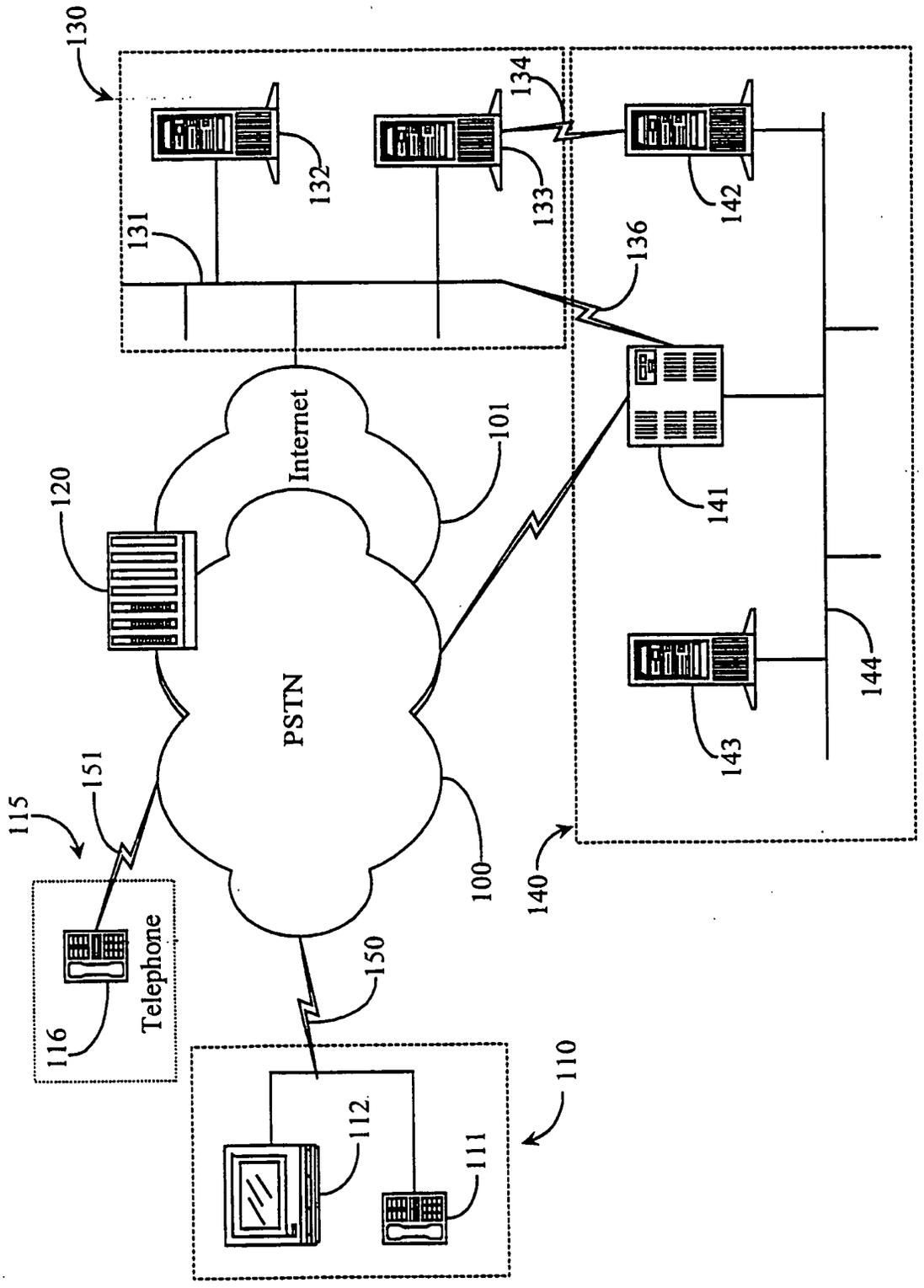
130
131
132
133
134
136
142
Internet
101
120
PSTN
141
143
144
115
151
Telephone
116
100
140
150
110
112
111

Fig. 1

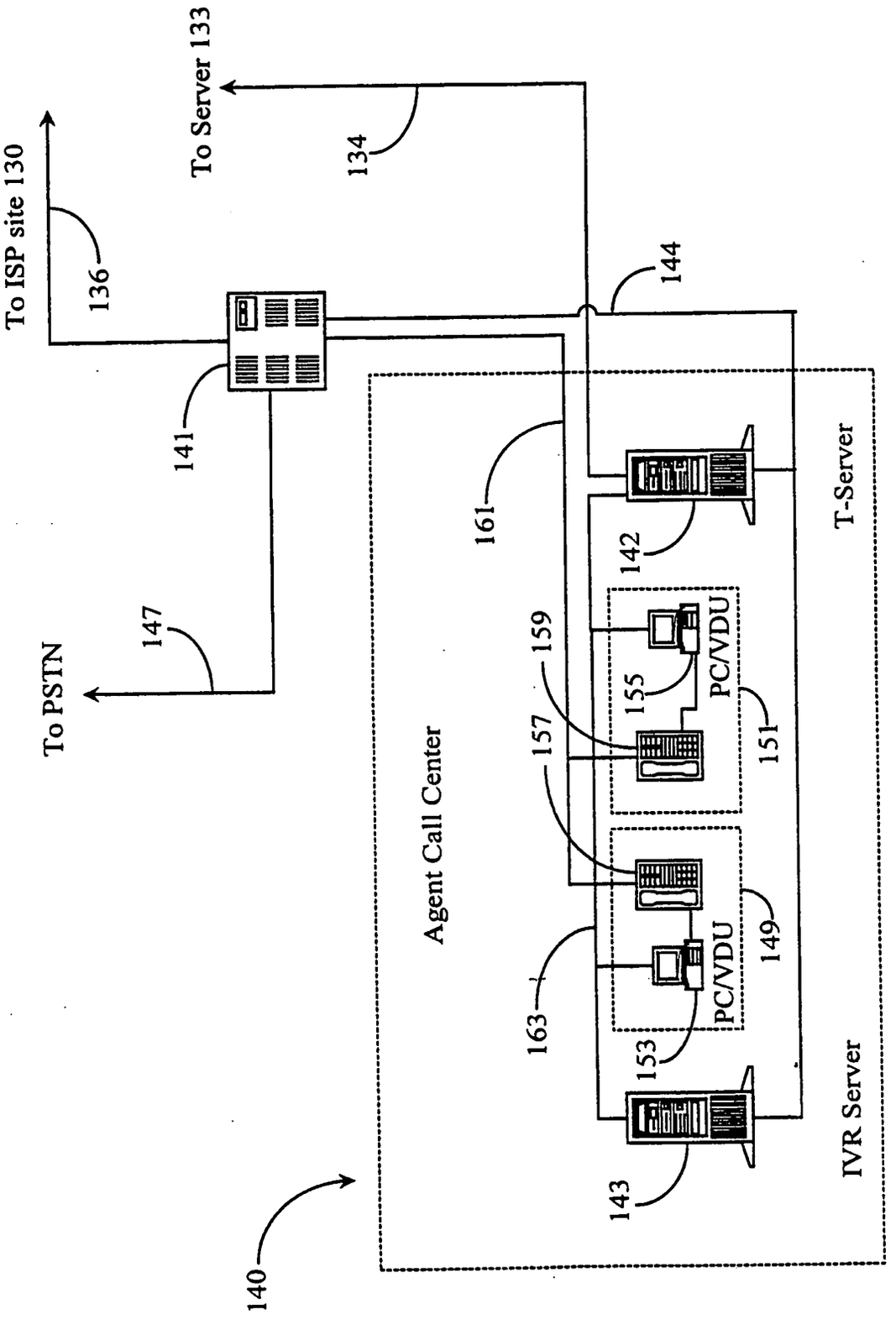
To Server 133
134
To ISP site 130
136
144
141
161
142
T-Server
147
159
To PSTN
155
PC/VDU
157
151
Agent Call Center
149
163
PC/VDU
153
IVR Server
143
140

Fig. 2

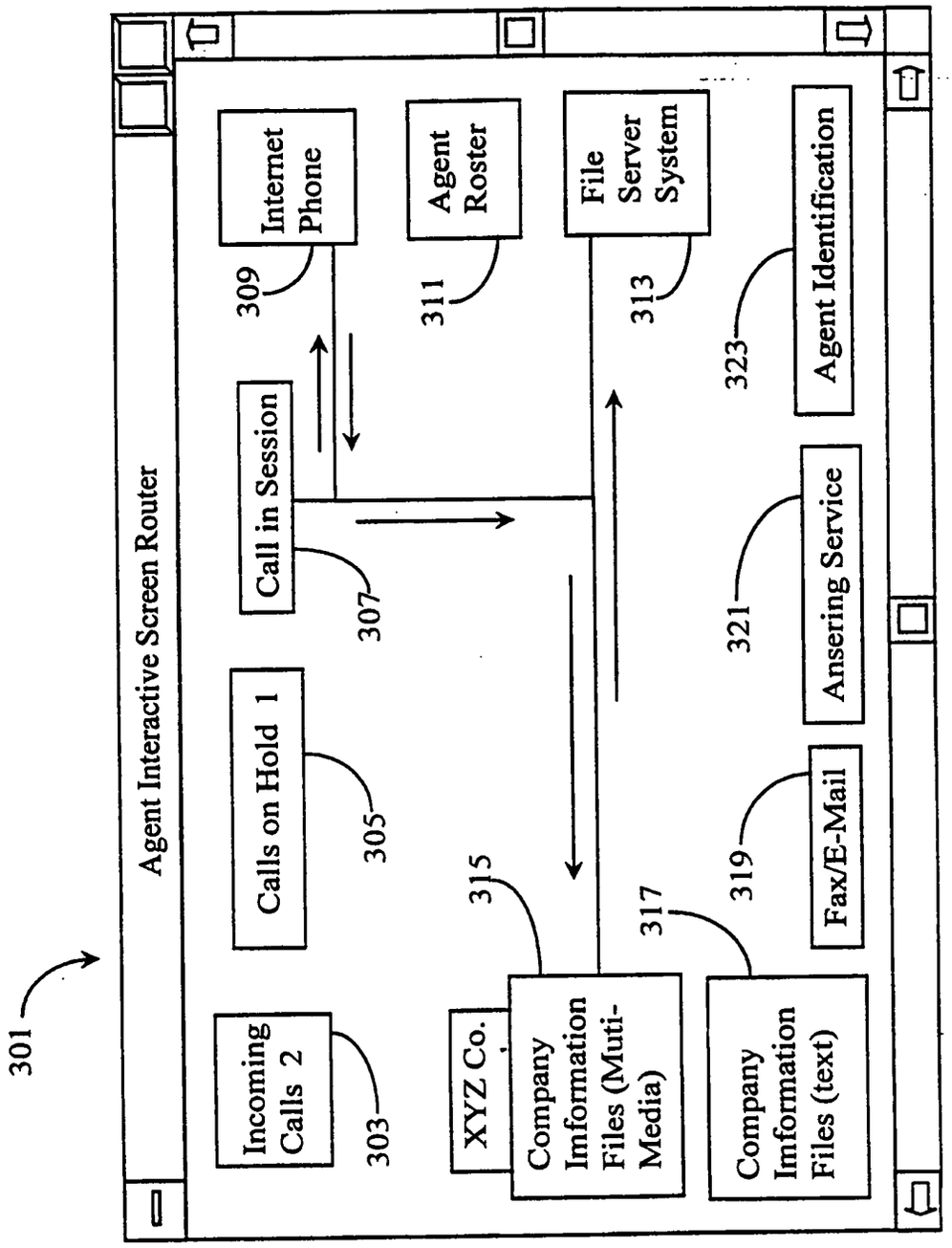
301
Agent Interactive Screen Router
Incoming Calls 2
303
Calls on Hold 1
305
Call in Session
307
Internet Phone
309
Agent Roster
311
File Server System
313
XYZ Co.
315
Company Imformation Files (Muti-Media)
317
Company Imformation Files (text)
319
Fax/E-Mail
Ansering Service
321
Agent Identification
323

Fig. 3

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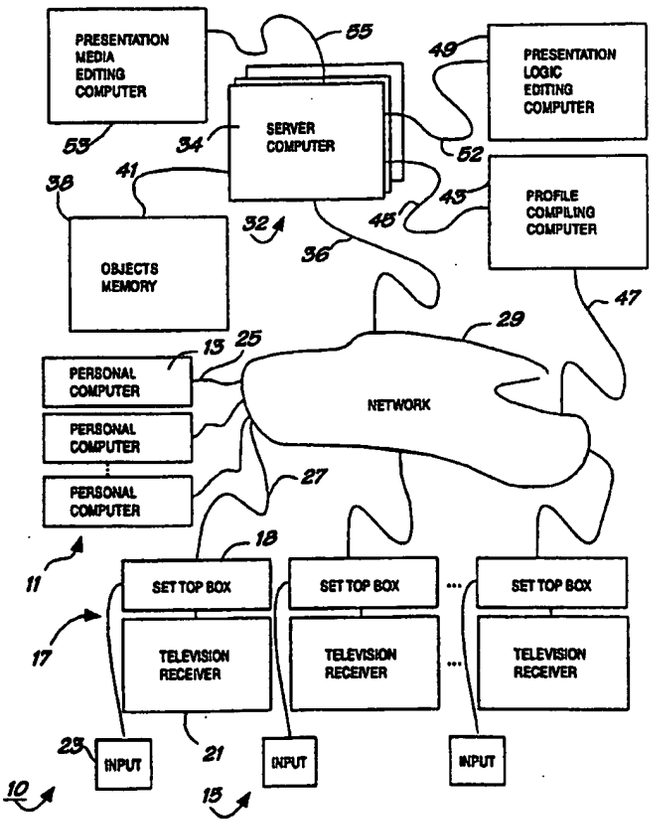
(54) Title: SYSTEM FOR CUSTOMIZING AND DISTRIBUTING PRESENTATIONS

(57) Abstract

A method and system for customizing and distributing for user sites (17) is disclosed and includes gathering user profile information to create data objects based on individual user profile information. The data objects are stored locally in a group of user computer sites (12). Presentation logic objects based on the data objects are created to facilitate the creation of individual customized presentations, at the user sites (17). The data objects are stored locally at the user computer sites (12). Presentation media objects are broadcast to the computer sites (12). Certain ones of the media components of the media objects are selected in response to the individual presentation logic objects and the individual data objects to create customized presentations for the users at their user sites (17).



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TITLE OF THE INVENTION

SYSTEM FOR CUSTOMIZING AND DISTRIBUTING PRESENTATIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

REFERENCE TO A "MICROFICHE APPENDIX"

Not Applicable

BACKGROUND OF THE INVENTION

Technical Field

The present invention relates in general to a method and system for customizing and distributing presentations for user sites. It more particularly relates to such a method and apparatus which can be utilized for broadcasting or otherwise transmitting to a large number of remotely located user sites customized presentations including audio, video or textual elements.

Background Art

Customized presentations have been created and successfully communicated to a large number of recipients. In so doing, each one of the recipients can receive an individually customized message or presentation in a highly effective and efficient manner. For example, reference may be made to the following United States patents:
4,671,772, 4,863,384, 5,099,422 and 5,550,735, which are incorporated herein by reference.

The foregoing patents are incorporated herein by reference, and disclose techniques for creating customizing or personalizing presentation media, such as video cassette tapes, computer memory devices or the

like. According to the patented techniques, information is gathered concerning each one of the users to facilitate the customization. Such information could include the name, address, preferences, and many other attributes of each recipient. Thus, the customized presentation can include personalization by incorporating the name of the user in the presentation.

Once this information has been gathered, the presentation media is then compiled from a library of presentation components. In one form of the patented inventions, the customized presentation is stored on a video cassette tape, which can be mailed or otherwise delivered to the recipient who can then play back the tape to receive the customized information. For example, the user may have ordered financial planning information concerning his or her specific personal requirements. The video cassette tape could then be played back with the use of a video tape recorder, whereby the recipient is able to witness an audio and visual presentation, which may include images of textual material. The entire presentation can be selected from only those presentation components which correspond to the attributes or requirements of the recipient. The customization can also include personalization, such as by employing the name of the user in the presentation itself.

The patented techniques also contemplate the delivery of the customized presentations via cable television or computer networks, such as the Internet. In this manner, the customized presentations are compiled at a centralized location, and then are able to be delivered directly to remotely located user sites equipped with devices such as cable television receivers or personal computers. The manner of delivery is via broadcast transmission over a transmission network, such

as a cable television network, the Internet or other computer networks, broadcast television, or a satellite system.

However, while such techniques may be successfully employed for many applications, there can be significant and unwanted bandwidth problems where a large number of presentation components and user sites are involved. For example, as shown in FIG. 2, assume a producer desires to deliver 100 uniquely by different customized individual presentations each being 10 minutes in length to 100 different remotely located user sites. In accordance with the patented methods of mass creation of unique presentations 1 through 100 indicated in FIG. 2, such presentations can be transmitted individually on demand.

This method can be made to perform satisfactorily for some applications, but it presents challenges for distribution in terms of the bandwidth required to transmit the presentations. For example, as indicated in FIG. 3, if all viewers wish to see their unique presentations at the same time, there must be sufficient transmission channels for all 100 presentations at one time. Thus, there must be a minimum of 100 channels. This requires an unduly large bandwidth requirement for some applications, both in terms of transmission bandwidth and server requirements.

If viewers are free to view their own presentation at any time as shown in FIG. 4, there is still the requirement to support the worst case of at least 100 separate channels to permit 100 simultaneous transmissions of 100 different presentations to 100 different user sites (FIG. 3). If there are not a sufficient number of channels for this worse case situation, then all users may not receive their desired transmissions. In this regard, if there are a smaller

number of channels as compared to the number of users, viewers making requests in excess of the network capacity will be informed that their request cannot be serviced until a later time, thereby providing a "busy signal." In the situation where a relatively large number of presentations and user sites are involved, the exceeding of the network capacity may well be highly undesirable and unwanted for some applications.

As indicated in FIG. 5, another approach may be to transmit all 100 presentations 1 through 100 within a single transmission channel to 100 different user sites. However, such an approach would require 100 different presentations times 10 minute intervals each for a total of 1,000 minutes of transmission time. Thus, such an approach may well be unduly burdensome for the transmission network.

Thus, it would be highly desirable to enable a large number of different customized presentations to be created and transmitted over networks to remotely located user sites, where the user can retrieve his or her own individualized presentation on demand, without unduly burdensome network bandwidth requirements or presentation server requirements. Also, such an arrangement should provide for conveniently and efficiently updating or otherwise modifying periodically the customized presentations and distributing them efficiently and effectively to a large variety of user sites at remote locations.

SUMMARY OF THE INVENTION

Therefore, the principal object of the present invention is to provide a new and improved method and system for customizing and distributing presentations for user sites.

A further object of the present invention is to provide such a new and improved method and system

wherein the customized presentations are transmitted over networks on demand without unduly oppressive bandwidth and presentation server requirements.

Another object of the prevent invention is to provide such a new and improved method and system wherein the customized presentations can be updated periodically in an efficient and effective manner.

Briefly, a method and apparatus for customizing and distributing presentations enables a large number of remotely located user sites to receive the presentations on demand without unduly burdensome network bandwidth and presentation server requirements. The presentations can be updated or otherwise modified periodically in a flexible and efficient manner.

A method and system for customizing and distributing for user sites is disclosed and includes gathering user profile information to create data objects based on individual user profile information. The data objects are stored locally in a group of user computer sites. Presentation logic objects based on the data objects are created to facilitate the creation of individual customized presentations, at the user sites. The data objects are stored locally at the user computer site. Presentation media objects are broadcasted to the computer sites. Certain ones of the media components of the media objects are selected in response to the individual presentation logic objects and the individual data objects to create customized presentations for the users at their user sites.

BRIEF DESCRIPTION OF DRAWINGS

The above mentioned and other objects and features of this invention and the manner of attaining them will become apparent, and the invention itself will be best understood by reference to the following description of

the embodiments of the invention in conjunction with the accompanying drawings, wherein:

FIG. 1 is a system block diagram of the presentation customizing and distributing system of the present invention;

FIGS. 2, 3, 4, 5, 6 and 7 are diagrams useful in understanding the present invention; and

FIGS. 8 and 9 are flow chart diagrams explaining the operation of the system of FIG. 1.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to the drawings, and more particularly to FIG. 1 thereof, there is shown a presentation customizing and distributing system 10, which is constructed in accordance with the present invention. The system 10 generally comprises a group of personal computer sites generally indicated at 11, such as a user site 12 in the form of a personal computer 13. The system 10 also includes a group of set top box user sites generally indicated at 15, such as a user site 17 in the form of a set top box 18 connected in communication with a television receiver 21, and having an input device 23, such as a keyboard, mouse or other such device. The computer equipment in the form of personal computers, set top boxes, and other similar types of devices located at the user sites are conventional, and are adapted to receive down loaded messages or presentations.

Cables, such as cables 25 and 27 interconnect the computer devices, such as the respective personal computer 13 and the set top box 18, to a transmission network 29, such as a cable television network, an Internet or other computer network, a broadcast television network, or a satellite system. A group of host server computers generally indicated at 32 include a host server computer 34 connected via a cable 36 to

the network 29 and via a cable 41 to an objects memory 38. The objects memory 38 stores presentation media objects which include a set of media components. Also stored in the object memory 38 are profile data objects which are based on user profile information for the users associated with the user sites. Additionally, presentation logic objects are also stored and are based on data objects to facilitate creating customized presentations.

A profile compiling computer 43 is connected via a cable 45 to the server computer 34 to facilitate the compiling of the profile data objects. A cable 47 also connects the profile compiling computer 43 to the network 29 so that the computer 43 can also function interactively directly with the computer devices, such as the personal computer 13 for compiling the profile data objects. A presentation logic editing computer 49 is connected by a cable 52 to the host server computer 34 and facilitates the editing of the presentation logic objects.

The inventive system 10 shown in FIG. 1 facilitates the distribution of different customized presentations to many viewers using a common network or broadcast infrastructure such as the Internet or other computer network, a cable television system or network, a broadcast television network, or a satellite system. The system 10 enables massive transmissions of large numbers of uniquely different customized presentations to each one of the user sites without unduly burdening the network bandwidth requirements or host server computer capacity.

In operation, for example, in accordance with the inventive method, user profile information is gathered by utilizing the profile compiling computer 43. The profile data object is then created based on the

individual user profile information. The data objects are then conveyed to the host computer 34, which in turn stores the data objects in the object memory 38. The data objects can be transmitted from the host server computer 34 via the network 29 to the individual selected user site, such as the user site 17.

Presentation logic objects are created based on the data objects to facilitate the creation of individual customized presentations. The presentation logic objects may be created by the host server computer 34. The presentation logic objects may be stored centrally in the object memory 38, and then when desired, can be down loaded to the individual user for storing it locally.

The host server computer 34 creates presentation media objects with the help of the presentation logic editing computer 49, and stores the media objects in the object memory 38.

The host server computer 34 broadcasts a projection media object including a set of media components to a group of remotely located user computer devices, such as the set top box 18 at the user site 17. The set top box 18 then selects certain ones of the media components in response to its presentation logic object and its data object. The set top box 18 then arranges the selected ones of the data object components to create a customized presentation for the user. The presentation can then be played back by the set top box in combination with the television receiver 21.

In accordance with the inventive method as indicated in FIGS. 6 and 7, assume that there are 30 basic presentation components, and that there are a total of 100 different user sites. Some of the presentation components are common presentation components shared between 100 unique presentation

components (FIG. 6) for local storage at a user site such as the site 17 and then play back only the appropriate desired sequence of presentation components corresponding to the individual attributes for display to the user on demand.

As indicated in FIG. 7, the presentations may be stored on a user computer device at a user site for later viewing on demand. Some of the transmission issues can be simplified by scheduling the transmission of presentations in advance of the viewing need. This is accomplished in accordance with the present invention by sending all 100 presentations during the same 10 minute time slot for the fastest and most bandwidth and server computer intense transmission.

As shown in FIGS. 6 and 7, the inventive method represents an improvement over the prior known methods and is possible if there are presentation components or segments common to many of the presentations. If, upon analysis, it is discovered that the 100, 10 minute presentations are composed of 30 common one minute presentation segments played for each presentation in different orders or repetitions, and assuming there is a sufficiently capable client device, it is possible to transmit only the needed presentation elements and assemble the presentation as it is viewed. The host computer 34 need only transmit 30 minutes of programming as shown in FIG. 7, ten of which are selectively recorded by client computer device for sequencing and presentation at the time of viewing at a user site such as the site 17.

Thus, 30 presentation components are broadcasted in, for example, 30 minutes to all user sites, and are locally stored thereat. By selecting and arranging the components locally, the entire transmission is completed in only 30 minutes, as compared to 1000 minutes as

indicated in the method illustrated in FIG. 5. As a result, according to the inventive method as indicated in FIGS. 6 and 7, 100 unique customized presentations are thus distributed via a single channel without burdening the bandwidth or server computer requirements.

The examples illustrated in the drawings are simplified for sake of clarity by having 10 same segment length segments of combined audio and video. It should be evident to someone skilled in the art that these segments may be of various lengths and may be audio, motion picture video, text video, or a combination thereof. Further, it should be understood to those skilled in the art that although the segments identified are audio or video, they may also be any other kind of digital information such as text, graphics or programming objects such as Java programming objects.

Further, it will become apparent to those skilled in the art that in addition to sequencing of segments and other elements, a client computer device such as the personal computer 13 may be capable of mixing and combining segments and elements together in various ways as desired. For example, one of the transmitted elements may be a music track for the presentation to be created that has not been combined with any other element. This music track may be mixed or otherwise combined with other audio information as the presentation is viewed by the client computer device. Further, a sufficiently capable client computer device may create graphic elements and composite them with video elements as needed. Any combination of media and/or data which can be accomplished by the client computer device live in real time, or which can be created in advance of presentation, may be utilized.

These examples assume real time transmission of programming such as is conventionally achieved in cable

television systems currently. It should be understood that the present inventive method can be applied to non-real time applications as well. Such applications can be either faster or slower than real time. Also, some elements for the same presentation may transmit at faster than real time, while others are sent in real time or slower than real time.

Considering now the method of the present invention, profile data is collected for each recipient. This data may come from survey instruments, multi-rater instruments, expert input or inferred data based on behavior monitoring. The data may be collected via the profile compiling computer 43 or in an interactive manner directly between the computer 43 and the user device such as the personal computer 13 via the network 29.

In accordance with one mode of operation of the system 10, as shown in FIGS. 8 and 9, the central media repository server computer 34 broadcasts or multicasts all the presentation objects and each receiving computer device such as the personal computer 13 selects all or portions of the objects to save locally. As shown in box 54 of FIG. 8, in a more efficient method, the system 10 collects the data for all recipients (or a day abstract). The collected data are used to calculate and determine the required media objects for all presentations as shown in box 56. At box 58, from that processing, a list is generated which identifies all objects required to create all presentations. As indicated at box 61, this list of objects is then broadcast or multi-cast to recipients, such as the set top box 18.

Referring now to Fig. 9, storage for each recipient is loaded with the appropriate objects from the broadcast or multi-cast as shown at box 63. The

selection of what is stored may be based on profile data existing in the recipient device or a metascript of the stored presentation logic object in conjunction with its stored profile data object. The metascript may be part of the broadcast or multicast.

As indicated at box 65, once the presentation logic objects are present or available through streams to the recipient computer device, the presentation may be made to the user recipient.

All presentations described above are composed of these kinds of objects: presentation logic objects, presentation media objects, and profile data objects. Each of these kinds of objects is created and edited by applications appropriate for the purpose. For example, the presentation logic objects may be created in the presentation logic editing computer 49 which establishes the relationship between the various forms of media objects and the data objects.

The distinction between the three kinds of objects is made for sake of clarity. It will become apparent to those skilled in the art that these objects may have overlapping elements or redundant functions in a given implementation.

Further, it should be understood that any of the kinds of objects described may from time to time change from static objects to dynamic objects and back again. Objects may be updated in their entirety or incrementally.

Additionally, it will become apparent to those skilled in the art that these various objects may flow in any direction between the host server computers and client or user computer devices. For example, profile data objects may be created, added to or modified from time to time by the producer or the viewer or a third party (depending on the application) for use by them

and/or transmitted to one of the other three. Similarly, depending on the application, the producer, viewer or a third party may modify presentation media object or presentation logic objects.

Presentation logic objects and/or various objects that are a part of a presentation may have communication with other servers or peers on the network 29. For example, a media object may obtain data updates on a periodic, demand or interrupt basis from a data source such, for example, such as a stock market.

The transmission of objects may be over the network 29, or other media.

Physical Therapy Example

The process for a physical therapy application begins with a video prescription filled in by a (physician or) physical therapist. The video prescription is filled out as a form on a World Wide Web page via the network 29 (FIG. 1) by the therapist. The therapist provides the patient's name, billing information, electronic address information, therapeutic objective, relevant history, relevant demographics and exercise regimen. The resulting data object is transmitted to the fulfilling server.

The fulfilling server does appropriate billing and creation of the presentation logic object for the patient. The presentation logic object is transmitted via email to the patient's set top box such as the box 18 (FIG. 1). A portion of the email confirms the order and informs the patient as to when the exercises will be ready for viewing.

At the fulfillment server computer 34, the media and logic objects required for the patient's presentation are included in the list of materials to be transmitted. At a predetermined time, the objects are transmitted from the server computer 34 via the network

29 to the user sites, using a multicast which includes the objects for all patients receiving physical therapy.

The set top box of the patient stores the relevant objects from the multicast based on instructions from the presentation logic portion of the email.

When the materials are available, the patient runs the presentation and follows the directions, observing the appropriately described cautions to perform the needed exercises. At the end of each exercise, the patient responds to a data collecting object that asks the patient how the patient feels. These data are reported back to the physical therapist via the network 29 and may be used to automatically modify the program or allow the physical therapist to update the program based on his or her review of the data. The therapist may elect to modify the exercise regimen and transmit a new data object.

This cycle of data collection, exercise and program modification continue until the therapeutic objective has been reached. There are, of course, a variety of many different approaches to accomplish the desired result.

The presentation logic object could be created at the physical therapy's office computer (such as the personal computer 13) or in a client/server method.

There could be a version of the program using graphics or low quality video for guidance until the full media treatment is available.

Automotive Marketing Example.

An automotive example begins with the consumer indicating product interest in response to an advertisement shown from his or her television receiver. After indicating interest, the customer is asked to respond to a questionnaire on screen indicating other cars of interests, purchase horizon, and things that are

important to the customer. The customer is also asked permission to release relevant demographic data from their local profile.

The data object is sent to the fulfilling server computer, such as the computer 34, for follow up by the automotive company and a presentation logic object is created locally.

The presentation logic object selects from multiple broadcast streams as the viewer is watching and a real time presentation is shown to the customer ending with another response object asking if the customer would like a test drive at their local dealer.

The object transmitted with the commercial may send data back to the fulfilling server to retrieve the presentation object even though this could be generated locally. In doing so, the advertiser is guaranteed of receipt of customer data.

Rather than using simultaneous streams, the set top box such as the box 18 may also buffer segments as needed.

While particular embodiments of the present invention have been disclosed, it is to be understood that various different modifications are possible and are contemplated within the true spirit and scope of the appended claims. There is no intention, therefore, of limitations to the exact abstract or disclosure herein presented.

CLAIMS

What is claimed is:

1. A method for customizing and distributing presentations for user sites, comprising:

gathering user profile information;

creating profile data objects based on individual user profile information;

storing the profile data objects locally in a group of user computer means;

creating presentation logic objects based on the data objects to facilitate the creation of individual customized presentations;

storing the presentation logic objects locally in the group of user computer means;

broadcasting a projection media object including a set of media components to a group of remotely located user computer means;

receiving the media object at the group of user computer means;

selecting certain ones of the media components at each one of the user computer means in response to its presentation logic object and its data object; and

arranging the selected ones of said data object components to create customized presentations for the users.

2. A method according to claim 1, further including adding profile data objects periodically.

3. A method according to claim 1, further including modifying said profile data objects periodically.

4. A methods according to claim 1, further including adding media objects periodically.

5. A method according to claim 1, further including modifying said media objects periodically.

6. A system for customizing and distributing presentations for user sites, comprising:

means for gathering user profile information;

creating profile data objects based on individual user profile information;

means for storing the profile data objects locally in a group of user computer means;

means for creating presentation logic objects based on the data objects to facilitate the creation of individual customized presentations;

means for storing the presentation logic objects locally in the group of user computer means;

broadcasting a projection media object including a set of media components to a group of remotely located user computer means;

means for receiving the media object at the group of user computer means;

means for selecting certain ones of the media components at each one of the user computer means in response to its presentation logic object and its data object; and

arranging the selected ones of said data object components to create customized presentations for the users.

7. A system according to claim 6, further including means for adding profile data objects periodically.

8. A system according to claim 6, further including means for modifying said profile data objects periodically.

9. A system according to claim 6, further including means for adding media objects periodically.

10. A method according to claim 1, further including means for modifying said media objects periodically.

11. A method for customizing and distributing presentations for user sites by gathering user profile information characterized by:

creating profile data objects based on individual user profile information;

storing the profile data objects locally in a group of user computer means;

creating presentation logic objects based on the data objects to facilitate the creation of individual customized presentations;

storing the presentation logic objects locally in the group of user computer means;

broadcasting a projection media object including a set of media components to a group of remotely located user computer means;

receiving media objects at the group of user computer means;

selecting certain ones of the media components at each one of the user computer means in response to its presentation logic object and its data object; and

arranging the selected ones of said data object components to create customized presentations for the users.

12. A method according to claim 11, characterized by adding profile data objects periodically.

13. A method according to claim 11, characterized by modifying said profile data objects periodically.

14. A methods according to claim 11, characterized by adding media objects periodically.

15. A method according to claim 11, characterized by modifying said media objects periodically.

16. A system for customizing and distributing presentations for user sites including means for gathering user profile information, characterized by:

profile data objects are created based on individual user profile information, and the profile data objects are stored locally in a group of user computer means; wherein presentation logic objects are created based on the data objects to facilitate the creation of individual customized presentations, and are stored locally in the group of user computer means; wherein projection media objects including a set of media components are broadcasted to a group of remotely located user computer means for receipt at the group of user computer means for selecting certain ones of the media components at each one of the user computer means in response to its presentation logic object and its data object, and the selected ones of said data object components are arranged to create customized presentations for the users.

17. A system according to claim 6, characterized by means for adding profile data objects periodically.

18. A system according to claim 6, characterized by means for modifying said profile data objects periodically.

19. A system according to claim 6, characterized by means for adding media objects periodically.

20. A method according to claim 1, characterized by means for modifying said media objects periodically.

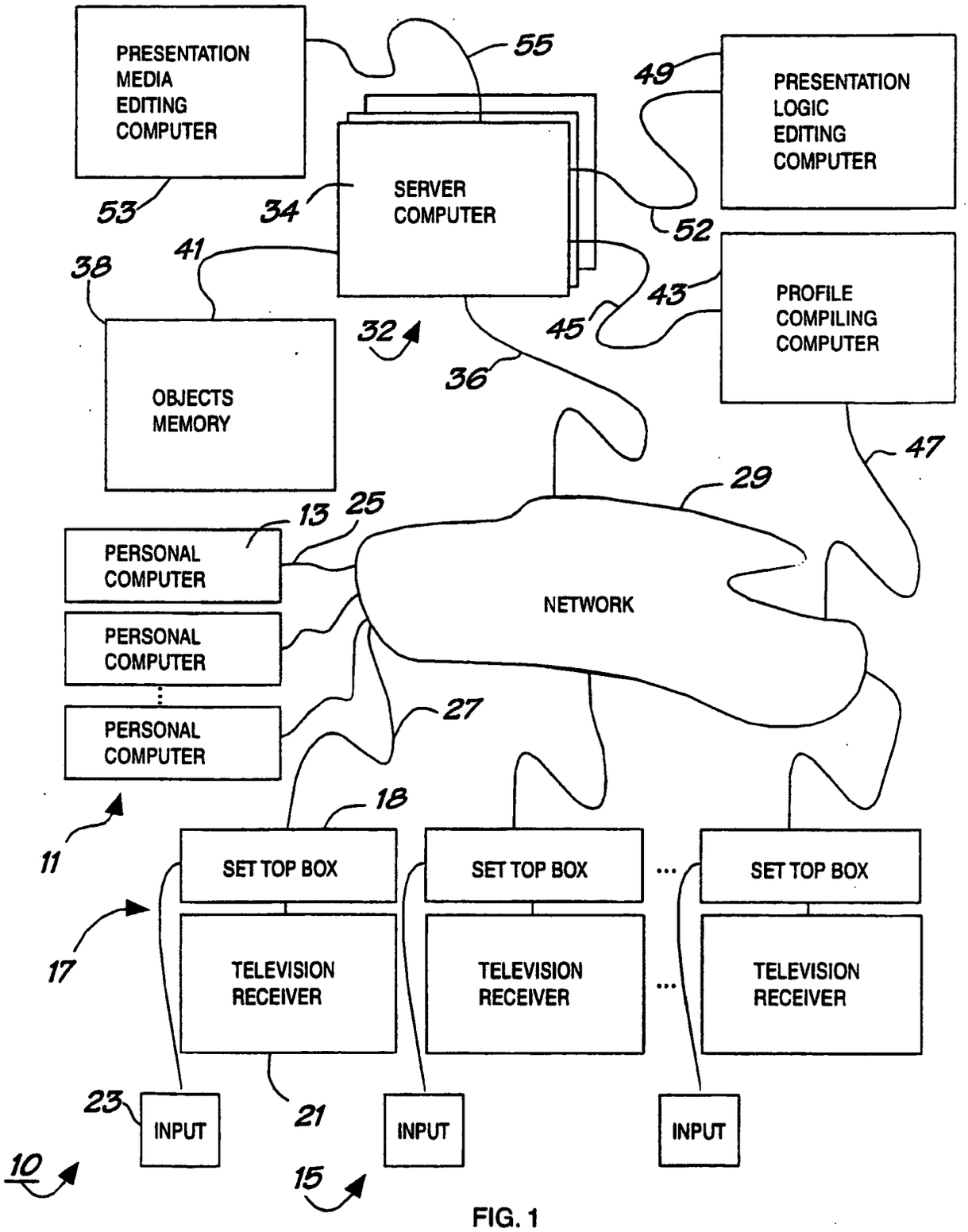
PRESENTATION MEDIA EDITING COMPUTER
55
49
PRESENTATION LOGIC EDITING COMPUTER
53
34
SERVER COMPUTER
52
41
38
43
PROFILE COMPILING COMPUTER
45
32
36
OBJECTS MEMORY
47
29
13
25
PERSONAL COMPUTER
NETWORK
PERSONAL COMPUTER
PERSONAL COMPUTER
27
18
11
SET TOP BOX
SET TOP BOX
SET TOP BOX
17
TELEVISION RECEIVER
TELEVISION RECEIVER
TELEVISION RECEIVER
23
21
INPUT
INPUT
INPUT
10
15

FIG. 1

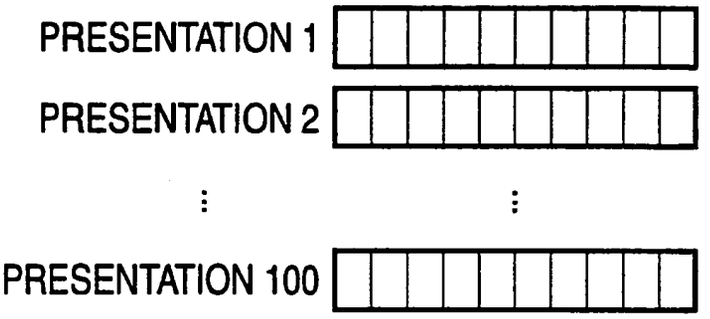
PRESENTATION 1
PRESENTATION 2
PRESENTATION 100

FIG. 2

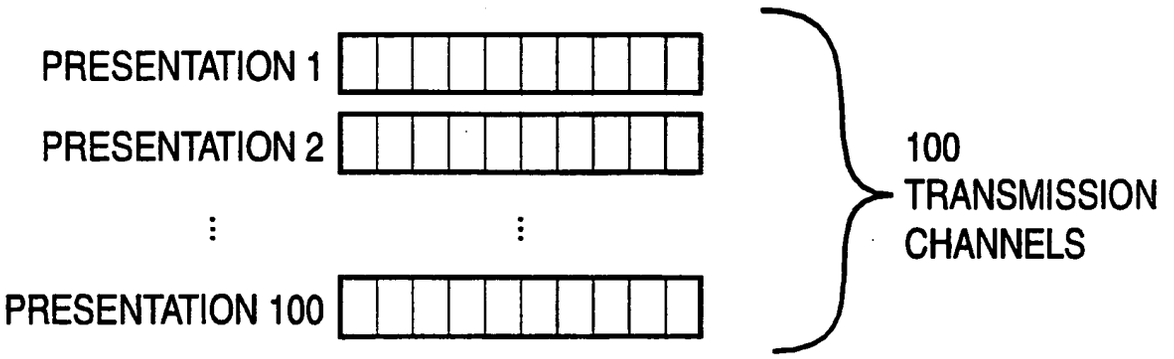
PRESENTATION 1
PRESENTATION 2
PRESENTATION 100
100
TRANSMISSION
CHANNELS

FIG. 3

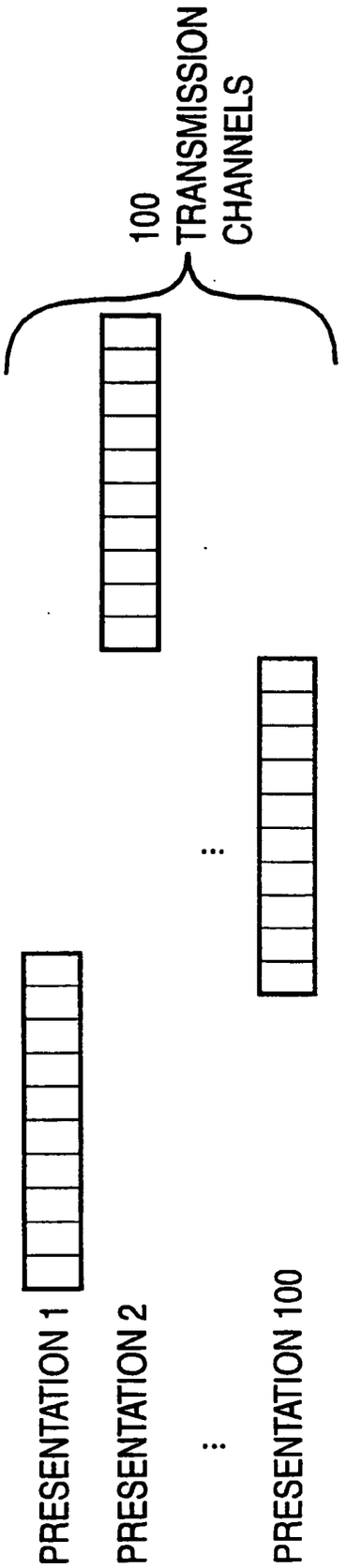
PRESENTATION 1
PRESENTATION 2
PRESENTATION 100
100 TRANSMISSION CHANNELS

FIG. 4

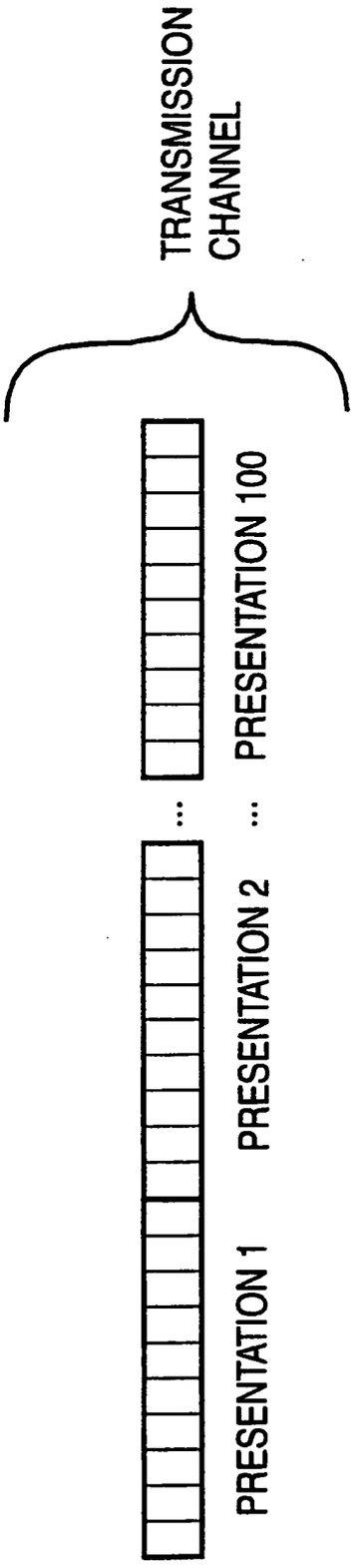
PRESENTATION 1
PRESENTATION 2
PRESENTATION 100
TRANSMISSION CHANNEL

FIG. 5

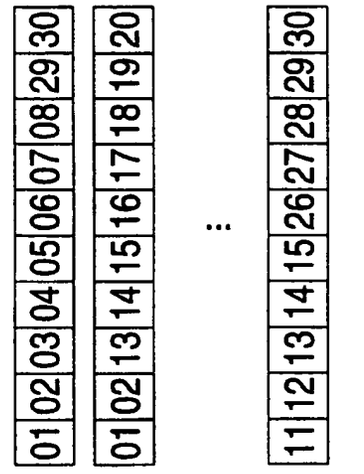
PRESENTATIONS WITH A SUBSET OF 30 COMMON SEGMENTS
PRESENTATION 1
01 02 03 04 05 06 07 08 29 30
PRESENTATION 2
01 02 13 14 15 16 17 18 19 20
...
PRESENTATION 100
11 12 13 14 15 26 27 28 29 30

FIG. 6

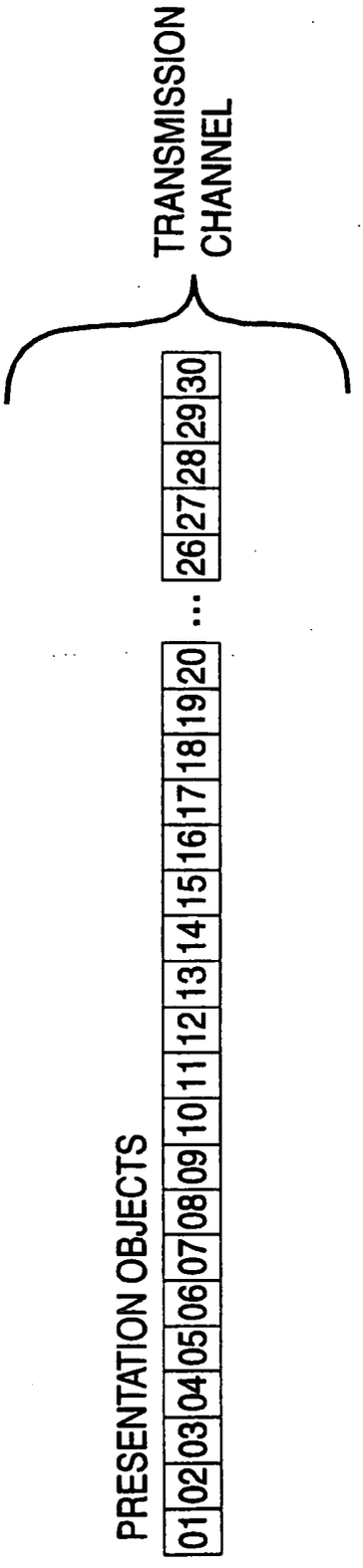
TRANSMISSION CHANNEL
PRESENTATION OBJECTS
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 ... 26 27 28 29 30

FIG. 7

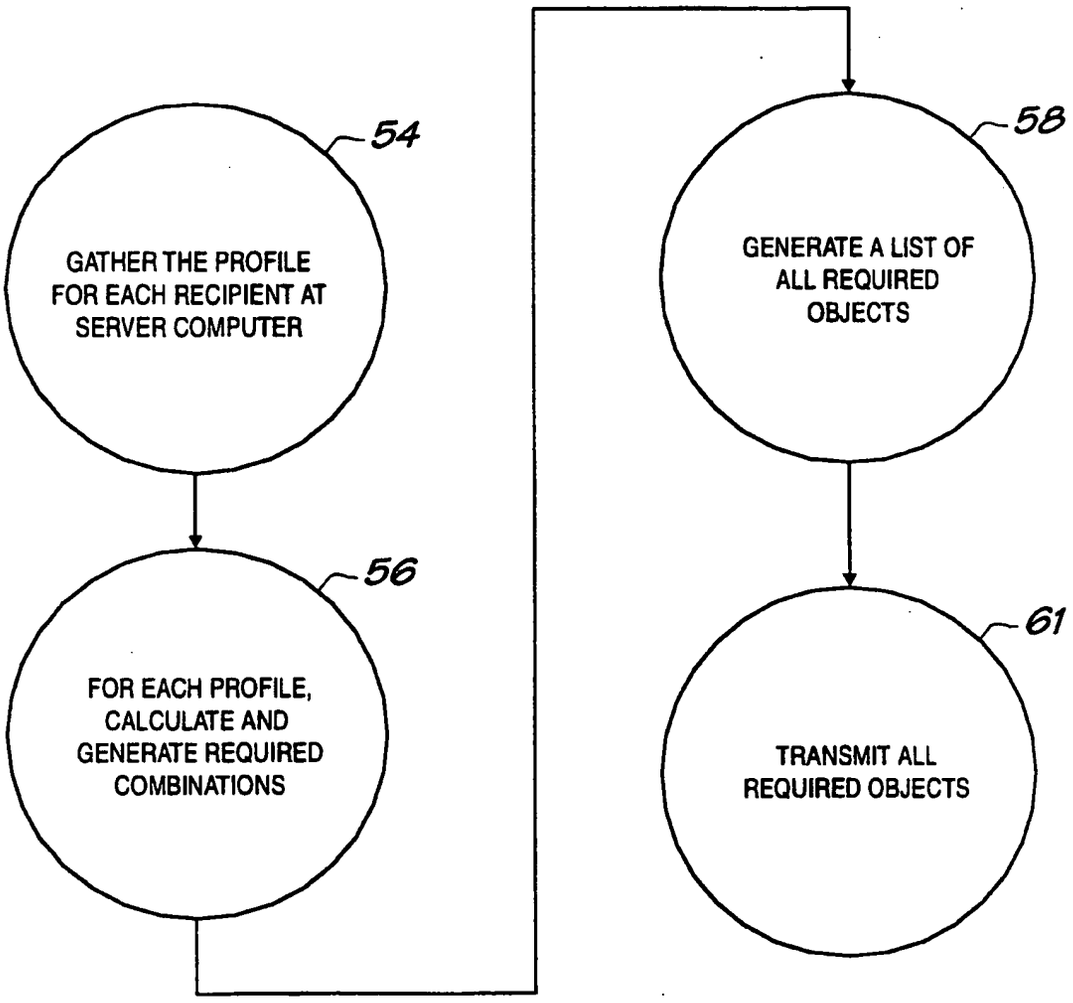
54
GATHER THE PROFILE FOR EACH RECIPIENT AT SERVER COMPUTER
56
FOR EACH PROFILE, CALCULATE AND GENERATE REQUIRED COMBINATIONS
58
GENERATE A LIST OF ALL REQUIRED OBJECTS
61
TRANSMIT ALL REQUIRED OBJECTS

FIG. 8

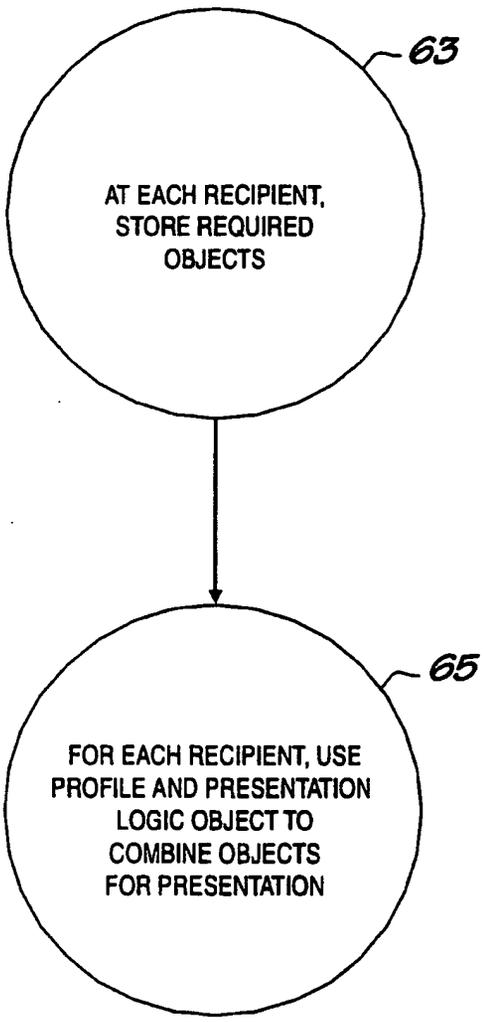
63
AT EACH RECIPIENT, STORE REQUIRED OBJECTS
65
FOR EACH RECIPIENT, USE PROFILE AND PRESENTATION LOGIC OBJECT TO COMBINE OBJECTS FOR PRESENTATION

FIG. 9

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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US CL 364/468.05

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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 practicable, search terms used)

APS
search terms: profile, user, presentation, information, site

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y, P	US 5,890,152 (RAPAPORT et al.) 30 March 1999 , entire document.	1-20
Y	US 5,550,735 (SLADE et al.) 27 August 1996 , entire document.	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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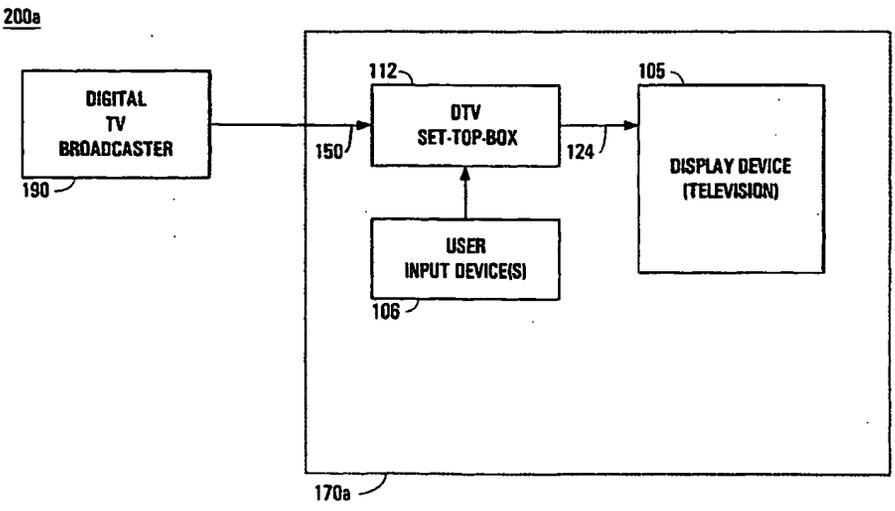

(57) Abstract

A client–side intelligent device (112) having background caching of web pages within a digital television (DTV) system (170a) having an intelligent device (112) interfacing with a user/viewer input device (106) and controlling the display of information on a display device (105). The intelligent device (112) in one embodiment, is a set–top–box but could be any intelligent electronic device or computer system. The set–top–box is configured to receive a DTV signal that includes audio/visual information as well as data signals in a datacast format. The datacast format includes web pages, e.g., in the HTML (hypertext markup language) format of the world wide web. An intelligent filter is used that modifies itself based on user behavior and user preferences in terms of the web pages that a viewer routinely visits. The intelligent filter is then used to identify certain web pages of the pages that are being broadcast and these identified web pages are stored in a cache memory for later use by the viewer.

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A METHOD AND A SYSTEM RELATING TO DIGITAL TELEVISION AND BROADCASTING

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to the field of digital television (DTV) systems and digital broadcasting. More specifically, the present invention relates to the fields of digital broadcasting and web browsing. In this description, among other items, there is described an intelligent device having background caching of web pages within a digital television system and the method of same.

RELATED ART

Heretofore, television systems have mainly been used to receive and display broadcast television signals (e.g., audio/visual programs) for television viewers. In Europe, a data transmission format called "Teletext" has been used which enables compatible television sets to receive a special video signal having encoded therein pages of text based information that can be displayed to a viewer. The viewer can select to thereby view certain text-based pages from a keyboard console or remote device, which can include a cursor directing device. The text-based pages are broadcast from the television broadcaster and some high end television sets can store all the text-based pages in a memory device. Although helpful for obtaining mainstream information, e.g., stock prices and reports, sports information, general news, weather reports, etc., the Teletext system is very limited in the number of pages it can support, e.g., about 100 pages, is very limited in that only text is used and provides no intelligent information filtering mechanisms with respect to the text-based pages. It would be desirable to provide a system that can support enhanced information viewing and navigation within a television system.

In the United States, the digital satellite system (DSS) television broadcast standard offers an on-screen programming guide that decodes text-based programming information from the television broadcast signal. The DSS on-screen programming information describes the schedule of television programs and acts like an electronic television guide. Also included are some text-based extended information that describe the subject matter of a particular television show, program or movie. Much like the Teletext system, the DSS on-screen programming information is only text-based, it uses a television set, is limited in the number of pages it can support and provides no intelligent information filtering mechanisms. It would be desirable to provide a system that can support enhanced information viewing and navigation within a television system.

Recently, digital television broadcast standards and digital television sets have been introduced and used. The use of cable systems and digital audio/visual systems into the home has introduced the set-top-box device. The set-top-box device acts as an intelligent controller for accessing and decoding cable programs from digital cable, e.g., terrestrial cable or from a digital satellite system. In the recently proposed home audio/visual network systems, e.g., the HAVi and AV/C standards, the set-top-box also acts as an intelligent controller to control the activities and communications of other electronic devices that can be coupled to the network, like a digital television, a video cassette recorder (VCR), a compact disk (CD) unit, a tuner, a personal computer system, etc. These electronic platforms allow an enhanced ability to access and display information in digital form that was not before possible in the realm of television media. It would be desirable to provide a system that can take advantage of this

enhanced ability to access and display digital information within a television system.

The internet protocol of the world wide web allows multiple computer systems to communicate and display information in a way not before possible. The internet protocol allows hypertext documents, e.g., documents in a hypertext markup language (HTML) format, to be communicated from a server to a client computer system for viewing and interaction therewith. In typical usage, a user interacts with a web browser of a host computer system that connects to the internet via a modem or via some other form of direct high speed digital connection. Once connected to the internet, the user can access information in the form of hypertext documents (web pages) that are stored on server computer systems located on the world wide web, which exists literally all over the globe. It would be desirable to provide a system that can take advantage of the enhanced ability to access and display digital information within a television system for displaying and accessing HTML documents.

SUMMARY OF THE INVENTION

Accordingly, the present invention takes advantage of the enhanced ability of a digital television system to access and display information to enhance a television viewer's entertainment and information gathering experience. The present invention provides a digital television (DTV) system capable of efficiently accessing and displaying viewer-selected web pages and other HTML documents to a viewer. The web pages and other HTML documents are sent over a digital broadcast to the DTV system of the present invention. These and other advantages of the present invention not specifically mentioned above will become clear within discussions of the present invention presented herein.

A client-side intelligent device having background caching of web pages within a digital television (DTV) system and method of same are described herein. The present invention includes a digital television system having an intelligent device for interfacing with a user/viewer and controlling the display of information on a display screen. The intelligent device, in one embodiment, is a set-top-box, but could be any intelligent electronic device or computer system. The set-top-box is configured to receive a digital TV broadcast signal (e.g., land based cable or digital satellite system) that may include audio/visual information as well as data signals in a datacast format. The datacast format includes web pages, e.g., in the HTML (hypertext markup language) format. The present invention allows a viewer to have his/her DTV set-top-box or HDTV (high definition TV) monitor and locally cache hypertext documents (and multi-media components), that are transmitted by digital broadcasters, to thereby enhance the internet connectivity performance. A forward caching process is used.

The DTV broadcasters support multiple channels of information on which digital content providers can supply a domain of web pages that are transmitted in round robin fashion on a periodic basis. The present invention is able to display viewer-selected hypertext documents on the DTV system from this domain. An intelligent filter is used to cache hypertext documents. The intelligent filter modifies itself based on user behavior, e.g., user history, and user preferences in terms of the web pages that a viewer routinely visits. The intelligent filter is used to identify certain web pages (or other HTML-based documents and multi-media components) of the data that are being broadcast and these identified web pages are stored in a cache memory for later use by the viewer. Hypertext documents are forward cached in that they are stored in the cache memory before they are displayed to the user. A second tuner can be used to poll multiple channels when updating the cached contents. Cached web pages avoid broadcast latencies (due to periodic updating) and thereby are displayed faster to the viewer. The use of cached web pages therefore enhances internet connectivity performance.

More specifically, embodiments of the present invention include a method of displaying information in a digital television system, the method comprising the steps of: a) maintaining an intelligent filter that records hypertext documents based on the frequency that hypertext documents were previously accessed by a viewer of the digital television system; b) monitoring datacast information decoded from a received digital television broadcast signal to identify newly received hypertext documents, the step b) comprising the steps of: b1) sequentially scanning a first tuner of the digital television system over channels of the digital television broadcast signal for a predetermined time period for each scanned channel; and b2) at each scanned channel, identifying

newly received hypertext documents. The method further comprising the steps of: c) storing into a cache memory any of the newly received hypertext documents that are recorded in the intelligent filter; d) receiving, from a viewer, an identifier of a selected hypertext document; and e) provided the selected hypertext document is located within the cache memory, accessing the selected hypertext document from the cache memory and displaying the selected hypertext document on a display screen of the digital television system.

Embodiments include the above and further comprising the step of f) using a second tuner of the digital television system to display contents of a selected channel to the viewer on the display screen wherein the datacast information comprises a domain of hypertext documents that are periodically broadcast. Embodiments include the above and wherein the step a) comprises the steps of: a1) receiving and recording identifiers of hypertext documents accessed by the viewer; a2) recording a count associated with each identifier received by the step a1), the count indicating the number of times each recorded hypertext document was accessed by the viewer; and a3) ranking the identifiers of the intelligent filter based on their associated counts. Embodiments further include a digital television system implemented in accordance with the above.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A illustrates a digital television system in accordance with one embodiment of the present invention.

Figure 1B illustrates a digital television system in accordance with a second embodiment of the present invention that includes a digital modem connection to the world wide web.

Figure 2 is a logical block diagram of an intelligent client device in accordance with one embodiment of the present invention.

Figure 3 is a hardware and software data flow diagram of the logical components of the intelligent client device of the present invention.

Figure 4 illustrates the background and foreground processes implemented within the intelligent client device of the present invention.

Figure 5 is a flow diagram illustrating steps of the foreground process of the intelligent client device of the present invention for accessing and displaying selected web pages and other hypertext documents.

Figure 6 is a flow diagram illustrating steps of the foreground process of the intelligent client device of the present invention for updating the intelligent filter based on viewer preferences and behavior, e.g., viewer history.

Figure 7A illustrates steps in the background process of one embodiment of the present invention for storing web pages and other hypertext documents in the cache memory of the intelligent client device.

Figure 7B illustrates steps in the background process of a two-tuner embodiment of the present invention for storing web pages and other hypertext documents in the cache memory of the intelligent client device.

DETAILED DESCRIPTION OF THE INVENTION

In the following detailed description of the present invention, an intelligent device within a digital television system for performing background caching of web pages, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be recognized by one skilled in the art that the present invention may be practiced without these specific details or with equivalents thereof. In other instances, well known methods, procedures, components, and circuits have not been described in detail as not to unnecessarily obscure aspects of the present invention.

NOTATION AND NOMENCLATURE

Some portions of the detailed descriptions which follow are presented in terms of procedures, logic blocks, processing, and other symbolic representations of operations on data bits within an intelligent electronic media device. These descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. A procedure, logic block, process, etc., is herein, and generally, conceived to be a self-consistent sequence of steps or instructions leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these physical manipulations take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated in a consumer electronic media device. For reasons of convenience, and with reference to common usage, these signals are referred to as bits, values,

elements, symbols, characters, terms, numbers, or the like with reference to the present invention.

It should be borne in mind, however, that all of these terms are to be interpreted as referencing physical manipulations and quantities and are merely convenient labels and are to be interpreted further in view of terms commonly used in the art. Unless specifically stated otherwise as apparent from the following discussions, it is understood that throughout discussions of the present invention, discussions utilizing terms such as "processing" or "computing" or "generating" or "calculating" or "determining" or "displaying" or the like, refer to the action and processes of a consumer electronic media device, or similar electronic computing device (e.g., dedicated or embedded computer system), that manipulates and transforms data. The data is represented as physical (electronic) quantities within the consumer electronic media device's registers and memories and is transformed into other data similarly represented as physical quantities within the consumer electronic media device memories or registers or other such information storage, transmission, or display screens.

DIGITAL TV SYSTEM

Figure 1A illustrates one embodiment of the client-side digital television ("DTV") system 170a of the present invention. DTV system 170a is coupled to receive a multi-channel digital television signal 150 from a digital TV broadcaster 190. Digital system 200a includes the broadcaster 190 and the client-side DTV system 170a. Within system 200a, the digital TV broadcast

signal 150 can be delivered to DTV system 170a using a terrestrial line (e.g., cable TV) or can be delivered via a wireless transmission mechanism (e.g., digital satellite system, etc.). In accordance with the present invention, a number of different and well known digital broadcast TV signal formats can be used to deliver the digital TV broadcast signal 150 to DTV system 170a. In one format, each channel of signal 150 has a bandwidth of approximately 19.2 Megabits per second (2.5 Megabytes per second) in which audio/visual and datacast information can reside. In one implementation, the American Television Standard Committee (ATSC) digital TV format is used. Several well known ATSC signal formats support datacast information transmission. In other embodiments, the Digital TV Applications Software Environment (DASE) signal format can be used.

The client-side DTV system 170a, of one embodiment, includes an intelligent client device ("intelligent device") 112 which is coupled to receive information from a user/viewer input device 106. The intelligent device 112, in one implementation, is a set-top-box and is also coupled (via bus 124) to a display device (e.g., a television) 105 for generating images and rendering sound. Optionally, separate speakers (not shown) can be used to generate the sound. The user/viewer input device 106 can be a number of different well known user input mechanisms including, for instance, a remote control, a physical keyboard, a mouse or other cursor directing device, a joystick, etc., and/or any combination of the above. The components of the intelligent device 112 are described in more detail with respect to Figure 2.

DTV system 170a of Figure 1A allows a viewer to see (e.g., browse) hypertext documents that are broadcast within encoded datacast information of the digital TV broadcast signal 150. The encoded datacast information can reside within a channel that also includes audio/visual programming or can reside within a channel dedicated to the transmission of digital datacast information. DTV system 170a of the present invention implements a mechanism for caching frequently visited hypertext documents (e.g., web pages) in a cache memory to enhance the internet connectivity experience of the viewer. Specifically, hypertext documents are cached in advance of being seen by the viewer. However, these documents are cached based on prior viewing behavior of the viewer. Digital TV broadcasting allows networks to broadcast datacast information (e.g., hypertext documents, HTML-based media and documents, web pages, etc.) over the digital TV signal. In accordance with the present invention, this digital information includes HTML-based documents related to (or not necessarily related to) the programming of the broadcaster. The present invention provides a viewer with a browser in the intelligent device 112 (e.g., set-top-box) or HDTV monitor. The system of the present invention is capable of storing (in cache memory) the latest versions of the hypertext documents visited by the viewer thereby allowing the viewer to access this information in a timely fashion.

The datacast information within the digital TV broadcast signal 150 is broadcast periodically. Within the system 170a of Figure 1A, the digital TV broadcast signal 150 is therefore monitored by the intelligent device 112 for

these hypertext documents. Based on the contents of an intelligent filter, those hypertext documents matching the filter are stored in a cache memory within the intelligent device 112. If a viewer should select a stored hypertext document (e.g., a cache hit) to view, then that selected hypertext document is obtained from the cache memory and displayed on display device 105. If the selected hypertext document is not stored in the cache memory (e.g., a cache miss occurs), then the intelligent device 112 access the selected hypertext document by monitoring the digital TV broadcast signal 150 until the hypertext document is next seen within the periodic broadcast.

Figure 1B illustrates an alternative embodiment of the present invention that includes a digital modem 108 as a second source for receiving hypertext documents. The digital mode 108 is capable of receiving hypertext documents from the internet. Client-side DTV system 170b includes the intelligent device 112 coupled to the digital modem 108 and to the user/viewer input device 106. The display device 105 is also coupled to the intelligent device 112. The digital modem 108 is coupled to the world wide web 180 that contains the internet protocol. Like the system 170a, system 170b of Figure 1A is coupled to receive a digital TV broadcast signal 150 from a digital TV broadcaster 190. The broadcaster 190, the world wide web 180 and the client-side DTV system 170b together constitute system 200b.

System 170b operates in an analogous fashion as system 170a with one exception. Upon a cache miss, system 170b can use the digital modem 108 to obtain the selected web page or hypertext document rather than waiting for its

next occurrence over the periodic broadcast of datacast information of the digital TV broadcast signal 150.

BROADCAST OF DATACAST INFORMATION WITHIN THE DIGITAL TV BROADCAST SIGNAL

With respect to system 170a and system 170b, the network broadcasters 190 broadcast a domain of hypertext documents in a periodic fashion, as discussed above. The number of documents within this domain is limited only by available channel bandwidth and expected latency. The document broadcast order is arbitrary, and typically established by the content provider. For instance, a 19.2 Megabit/second channel totally dedicated to the transmission of datacast information could broadcast about 200 hypertext documents per second. If a particular content provider wanted to establish a maximum latency of 20 seconds for any hypertext document, then about 200x20 or 4,000 hypertext documents would be the maximum number of documents within the domain for that channel. The broadcast order of the hypertext documents would be arbitrary and could be such that frequently visited documents get broadcast more often (e.g., with more frequency) than other lesser requested documents. In this case, different hypertext documents would have different maximum latencies.

However, many digital TV broadcast channels can share bandwidth between their audio/video information/programming and the datacast information. For instance, if a 19.2 Megabit/second channel contains audio, video and datacast information, it is likely that the datacast portion of the

channel would contain far fewer than 200 documents/second because the bulk of the available channel width would be consumed by the audio/visual programming. This constraint would limit the document domain size for such a channel.

HARDWARE AND SOFTWARE COMPONENTS OF INTELLIGENT DEVICE (COMPUTER SYSTEM)

Figure 2 illustrates the components of the intelligent device 112 in more detail. Any consumer electronic device can be provided with the appropriate computer system hardware to act as the intelligent device and thereby provide a platform for the processes of the present invention. For instance, a set-top-box device can be used. Another example of an intelligent device 112 is a digital television or computer system having the required hardware resources as described below. It is appreciated that certain aspects of the present invention, described below, are discussed in terms of steps executed on the intelligent device 112 (e.g., processes 400, 450, 480, 500a and 500b). Although a variety of different computer systems can be used as the intelligent device 112, an exemplary system is shown in Figure 2.

Intelligent device 112 of Figure 2 includes an internal address/data bus 100 for communicating digital information, one or more central processors 101 coupled with the bus 100 for processing information and instructions, a volatile memory 102 (e.g., random access memory RAM) coupled with the bus 100 for storing information and instructions for the central processor 101 and a non-volatile memory 103 (e.g., read only memory ROM) coupled with the bus 100 for

storing static information and instructions for the processor 101. A cache memory 102a resides within memory 102. As discussed more fully below, hypertext documents matching an intelligent filter are stored into the cache memory 102a for later use by the viewer. Intelligent device 112 can also optionally include a data storage device (not shown) such as a magnetic or optical disk and disk drive coupled with the bus 100 for storing information and instructions. The intelligent filter discussed above is a memory resident data structure and therefore may reside within memory 102.

Intelligent device 112 also includes a video decoder 120 coupled to bus 100 and coupled to supply a digital video signal 124 (e.g., to digital display device 105). A number of well known video decoders can be used for video decoder 120. Intelligent device 112 also includes an audio decoder 122 (e.g., a sound card) that is coupled to bus 100 and generates a digital audio signal over bus 126 (which can be coupled to external speakers). The video decoder 120 processes video information from bus 100 and the audio decoder 122 processes digital audio information from bus 100. Any of a number of well known audio decoders can be used for audio decoder 122 of the present invention. In one embodiment of the present invention, a two dimensional rendering engine 118 is also coupled to the bus 100 and coupled to the video decoder. The two dimensional rendering engine 118 processes graphics information and supplies the output as an overlay to the video decoder. In this way, graphics information can efficiently be overlaid with the other video information (including hypertext documents).

Digital TV broadcast information is received and processed by the intelligent device 112 from tuner 130 which is coupled to receive the digital TV broadcast signal 150. Optionally, a second tuner 132 can also be used to receive digital TV broadcast information. In one embodiment of the present invention, the second tuner 132 is not used. The first tuner 130 is coupled to a modulator 140 via bus 160 and the modulator 140 is coupled to bus 100. The modulator 140 performs analog to digital conversion of the signals of bus 160 and also acts as a bus interface for bus 100. The modulator 140 and the tuner 130 are well known. In an alternative embodiment, the second tuner 132 is coupled to a modulator 142 via bus 162 and the modulator 142 is coupled to bus 100. The modulator 142 performs analog to digital conversion of the signals of bus 162 and also acts as a bus interface for bus 100.

As discussed further below, the first tuner 130 is used for processing digital information used in foreground processing tasks. For instance, the first tuner 130 is controlled by the viewer and its contents are displayed in real-time on the television screen 105 for the viewer to enjoy. However, the second tuner 132 is used to perform background processing to maintain the contents of the cache 102a. In the embodiment that does not utilize the second tuner 132, the first tuner 130 is used to perform both the foreground and background tasks.

Under processor control from processor 101, digital audio/video information received from tuner 130 are directed over bus 100 to video decoder 120 and to audio decoder 122 for rendering on the display 105 and speakers

via bus 124 and bus 126. It is appreciated that bus 124 and bus 126 can be merged into one single larger digital bus carrying both video and audio data signals. Under processor control from processor 101, digital audio/video information received from optional tuner 132 are directed over bus 100 and are initially processed by an intelligent processor as shown in Figure 3. Hypertext documents from tuner 132 can be stored in cache memory 102a and if selected, are then transmitted on bus 100 to video decoder 120 and to audio decoder 122, as discussed above.

Figure 3 illustrates a data flow diagram of the intelligent controller 112 including hardware and software components. Tuner 130 and tuner 132 receive digital TV information from digital TV broadcast signal 150. Modulator 140 receives analog information from tuner 130 and generates a digital signal which is received by a demultiplexer 250. Modulator 142 receives analog information from tuner 132 and generates a digital signal which is received by a demultiplexer 250. Demultiplexer 250 can be hardware or software implemented and sorts out the audio, video and datacast portions of the digital signals received from the modulators 140 and 142. Digital video information is forwarded from demultiplexer 250 over data path 220a to a video processor 260. Video processor 260 can be software implemented, or alternatively, can be implemented in hardware, or can be a combination of both. Video processor 260 includes a video decoder 120 capable of decoding encoded video signals in well known formats such as MPEG (Motion Picture Expert Group) and MPEG II.

As discussed above, video processor 260 interfaces with a two dimensional rendering engine 290 which can be a hardware unit (as shown in Figure 2) or can be implemented as a software process as shown in Figure 3. Rendering engine 290 interfaces with both the video processor 260 and with a data processor 270 to overlay graphics information. Rendering engine 290 also directly interfaces with the cache memory 102a. The digital video signals are output over bus 124. Demultiplexer 250 also forwards digital audio signals over data path 220c to the audio processor 280 which generates audio signals over bus 126.

Demultiplexer 250 of Figure 3 also forwards digital datacast information over data path 220b to the data processor 270 which processes hypertext documents. Data processor 270 contains a browser. Any of a number of well known browsers, e.g., as commercially available from Netscape or Microsoft, can be used by data processor 270. Hypertext documents are rendered by data processor 270 and shipped to the rendering engine 290 for display over bus 124. An intelligent filter 300 is coupled to the data processor 270. Data processor 270 also directly interfaces with the cache memory 102a. In accordance with the present invention, intelligent filter 300 is a software unit and receives an identifier of each hypertext document received by data processor 270. In one embodiment, the identifier is the web address of a web page. The intelligent filter 300 has recorded therein a listing of identifiers corresponding to frequently visited web pages. This information is compiled based on past viewer behavior.

The intelligent filter 300 stores into cache memory 102a each hypertext document that is received by data processor 270 and that also matches an identifier stored in the intelligent filter 300. Hypertext documents not within the intelligent filter 300 are not stored in the cache memory 102a. The size of the cache memory 102a depends on the number of hypertext documents that are desired for storage and typically becomes an implementation choice depending on available memory resources. A 10 Megabyte cache memory 102a can store about 1,000 web pages.

CACHING PROCESSES OF THE PRESENT INVENTION

Figure 4 illustrates the major processes of the present invention to implement a digital TV web caching system. Process 400 is the foreground process and responds to a user/viewer selecting a particular web page or other hypertext document for display. At step 450, the intelligent device 112 accesses and displays a selected web page. At step 480, the intelligent filter 300 is then updated based on the user/viewer selections. In this way, the intelligent filter 300 is updated based on the behavior and viewing patterns/history of the user. Process 400 then repeats.

In the background, process 500 updates the cache memory 102a based on information received over the digital TV broadcast signal and based on the contents of the intelligent filter 300. Process 500 is cyclic. It is appreciated that the intelligent device 112 caches web pages based on the intelligent filter 300 and that this caching activity occurs in the background. It is appreciated that the

present invention performs "forward" caching in that web pages and other hypertext documents are cached before they are viewed using the browser. It is further appreciated that both process 400 and process 500 are implemented as instructions stored within computer readable memory units of intelligent device 112 and executed on processor 101.

Figure 5 is a flow diagram illustrating the steps within foreground process 450. At step 452, the intelligent device 112 receives a user/viewer originated request for a particular desired hypertext document (e.g., a particular web page). This request typically is received in the form of a web page address typed in (or otherwise selected) by a viewer using the user input device 106. At step 454, the present invention checks the contents of the cache memory 102a to determine if this hypertext document is currently stored in the cache memory 102a. At step 456, a check is made if a cache hit occurs (e.g., the selected hypertext document is stored in the cache memory 102b) or if a cache miss occurs (e.g., the selected hypertext document is not stored in the cache memory 102b).

If a cache hit occurs at step 456, then process 450 flows to step 464 where the intelligent device 112 obtains the selected hypertext document from cache memory 102a. At step 466, the intelligent device 112 then displays the selected hypertext document on the digital display screen 105. Upon a cache hit, no latency is perceived by the user from step 452 to step 466. Process 450 then returns.

If a cache miss occurs at step 456, then process 450 flows to step 458. At step 458, if the DTV system of the present invention contains a digital modem, it can optionally be used to obtain the selected hypertext document from the internet. Within the preferred embodiment, the DTV system of the present invention, at step 458, uses the digital TV broadcast signal 150 to obtain the selected hypertext document. At this step, the DTV system monitors the digital TV broadcast signal 150 until its periodic broadcast transmits the selected hypertext document. At step 458, a latency can be detected by the viewer between the request and the display of the selected hypertext document. The duration of the latency depends on the maximum latency for hypertext documents as determined by the content provider of the currently tuned channel. The latency is also determined by the timing of step 458 within the periodic broadcast of hypertext documents. At step 460 and step 462, the selected hypertext document is located and it is stored within a memory unit of the intelligent device 112. At step 466, the selected hypertext document is then displayed on the digital screen. Process 450 then returns.

The provision of the cache memory 102a therefore increases the user's internet connectivity experience, in accordance with the present invention, by eliminating any perceived latencies for selected web pages that are associated with a cache hit.

Figure 6 is a flow diagram illustrating the steps within foreground process 480 for updating the intelligent filter 300 based on user/viewer behavior. At step

482, if the currently selected hypertext document is not recorded in the intelligent filter 300, then it is recorded with an associated initial count (e.g., 1). At step 482, if the currently selected hypertext document is already recorded in the intelligent filter 300, then its associated count is incremented by one. In either case, an identifier of the selected hypertext document is recorded in the intelligent filter 300. At step 482, if the intelligent filter 300 becomes filled, as new hypertext documents are recorded, those recorded hypertext documents with the lowest count are dropped off. Optionally, at step 482, a timestamp is recorded with each recorded hypertext document indicating the time and date that the user last visited the web page.

At step 484, the present invention then ranks all of its recorded entries by count number with those hypertext documents with the largest count placed higher in the recorded list. At step 486, the present invention then optionally drops off of the recorded list any hypertext document that has not been visited by the viewer for a predetermined time period. This optional function is facilitated by the timestamps discussed above.

Figure 7A and Figure 7B illustrate two different versions of background process 500 for filling the cache memory 102a. Process 500a and process 500b are "background" processes in that they operate constantly whether or not the user/viewer is interacting with the DTV system. Process 500a of Figure 7A corresponds to DTV system 170a (Figure 1A) that has one tuner. Process 500b of Figure 7B is used with DTV system 170b (Figure 1B) that contains two tuners.

Process 500a of Figure 7A commences at step 502 where the first tuner 130 receives a web page or other hypertext document from the currently tuned channel of the digital TV broadcast signal 150. The viewer can alter the currently tuned channel at any time while process 500a is operating. During TV watching periods, the information received by tuner 130 is displayed in real-time on the display screen 105. At step 504, the intelligent device 112 compares the encoded identifier of the received hypertext document (e.g., the web page address) against the identifiers that are recorded in the intelligent filter 300. At step 506, if a match occurs then step 508 is entered, otherwise, step 502 is entered and this process continues for the next received hypertext document of the currently tuned channel.

At step 508, the intelligent device 112 receives and stores the current hypertext document into the cache memory 102a. If a previous older copy of the hypertext document is stored in the cache memory 102a, then at step 508, the present invention replaces the old copy with the new copy. If a previous same copy of the hypertext document is stored in the cache memory 102a, then at step 508, the present invention ignores the current hypertext document. It is appreciated that each hypertext document contains an identifier that can be used to determine if one hypertext document is the same or an older or a newer version of another hypertext document. After step 508 completes, step 502 is entered again to process the next received hypertext document. As described above, process 500a is limited in that only the currently tuned channel (e.g., that is also used by the viewer) is used to update cache memory 102a.

Figure 7B illustrates the steps of process 500b. Process 500b utilizes the second tuner 132 to update the cache memory 102a by continuously polling the available channels in a round robin fashion to update the cache memory 102a. In this way, the particular program selected by the viewer does not limit the scope of information that can be used to update the cache memory 102a. In other words, process 500b allows the cache memory 102a to be updated based on information that is being broadcast over one channel (e.g., using tuner 132) while the viewer is currently watching a program, or viewing other media information, on another channel (e.g., using tuner 130).

At step 510 of Figure 7B, the present invention receives datacast information over the channel that is currently tuned by the second tuner 132. The user/viewer is not allowed to alter the channel being tuned by tuner 132. Only the processor 101 of the intelligent device 112 can alter tuner 132 by program control. At step 510, a hypertext document is received by the intelligent device 112 from the second tuner 132. At step 512, the intelligent device 112 compares the encoded identifier of the received hypertext document (e.g., the web page address) against the identifiers that are recorded in the intelligent filter 300. At step 514, if a match occurs then step 516 is entered, otherwise, step 518 is entered.

At step 516, the intelligent device 112 receives and stores the current hypertext document into the cache memory 102a. If a previous older copy of the hypertext document is stored in the cache memory 102a, then at step 516, the

present invention replaces the old copy with the new copy. If a previous same copy of the hypertext document is stored in the cache memory 102a, then at step 516, the present invention ignores the current hypertext document. It is appreciated that each hypertext document contains an identifier that can be used to determine if one hypertext document is the same or an older or a newer version of another hypertext document. After step 516 completes, step 518 is entered.

At step 518, the intelligent device 112 checks if a predetermined time period has expired. Each available channel is scanned according to process 500b only for a predetermined time period. Once this time period expires, a new channel is used. At step 518, the present invention determines if the time period for the currently tuned channel has expired. If not, then step 510 is entered and the next hypertext document is received from the same tuned channel. In one implementation, the time period is 20 seconds for each channel but could be any reasonable period or could be programmable or could vary from channel to channel.

At step 518, if the time period for the currently tuned channel expires, then at step 520 the second tuner 132 is tuned to the next channel and the time period is reset. Step 510 is then entered to obtain the next hypertext document from the newly tuned channel. Process 500b repeats in this fashion. It is appreciated that the user can tune tuner 130 to any channel at any time during process 500b and this action will not alter the results of process 500b.

Therefore, process 500b is not limited to the particular channel being watched by the user (e.g., via tuner 130).

The preferred embodiment of the present invention, an intelligent device within a digital television system for performing background caching of web pages, is thus described. While the present invention has been described in particular embodiments, it should be appreciated that the present invention should not be construed as limited by such embodiments, but rather construed according to the below claims.

CLAIMS

What is claimed is:

1. In a digital television system, a method of displaying information comprising the steps of:

a) maintaining an intelligent filter that records hypertext documents that were previously accessed by a viewer of said digital television system;

b) monitoring datacast information decoded from a digital television broadcast signal to identify newly received hypertext documents;

c) storing into a cache memory any of said newly received hypertext documents that are recorded in said intelligent filter;

d) receiving, from a viewer, an identifier of a selected hypertext document; and

e) provided said selected hypertext document is located within said cache memory, accessing said selected hypertext document from said cache memory and displaying said selected hypertext document on a display screen of said digital television system.

2. A method as described in Claim 1 wherein said step a) comprises the steps of:

a1) receiving and recording identifiers of hypertext documents accessed by said viewer;

a2) recording a count associated with each identifier received by said step a1), said count indicating the number of times each recorded hypertext document was accessed by said viewer; and

a3) ranking said identifiers of said intelligent filter based on their associated counts.

3. A method as described in Claim 2 wherein said step a) further comprises the step of a4) removing from said intelligent filter any recorded identifier of a hypertext

document that has not been accessed by said viewer for a predetermined time period.

4. A method as described in Claim 1 wherein said step b) comprises the steps of:

b1) tuning a tuner to a selected channel within said digital television broadcast signal and receiving datacast information therefrom for a time period;

b2) identifying newly received hypertext documents from said datacast information of said step b1);

b3) provided said time period expired, updating said selected channel and initializing said time period; and

b4) repeating said steps b1) - b3).

5. The method of claim 1 wherein the digital television system is a client-side digital television system, and wherein in step a) the hypertext documents are based on the frequency that the hypertext documents were previously accessed by said viewer; and in step b) the digital television broadcast signal is a received digital television broadcast signal, step b) further comprising the steps of:

b1) sequentially scanning a first tuner of said digital television system over channels of said digital television broadcast signal for a predetermined time period for each scanned channel; and

b2) at each scanned channel, identifying newly received hypertext documents.

6. The method as described in Claim 5 further comprising the step of f) using a second tuner of said digital television system to display contents of a selected channel to said viewer on said display screen.

7. The method as described in Claim 1 or 5 wherein said datacast information comprises a domain of hypertext documents that are periodically broadcast.

8. The method as described in Claim 6 or 7 further comprising the step of f) provided said selected hypertext document is not located within said cache memory, obtaining said selected hypertext document upon its next occurrence within said datacast information and displaying said selected hypertext document on said display screen of said digital television system.

9. A method as described in Claim 6 or 7 further comprising the step of f) provided said selected hypertext document is not located within said cache memory, obtaining said selected hypertext document from a digital modem coupled to the word wide web and displaying said selected hypertext document on said display screen of said digital television system.

10. A method as described in Claim 6 wherein said step a) comprises the steps of:

a1) receiving and recording identifiers of hypertext documents accessed by said viewer;

a2) recording a count associated with each identifier received by said step a1), said count indicating the number of times each recorded hypertext document was accessed by said viewer;

a3) ranking said identifiers of said intelligent filter based on their associated counts; and

a4) removing from said intelligent filter any recorded identifier of a hypertext document that has not been accessed by said viewer for a predetermined time period.

11. A method as described in Claim 1 or 6 wherein said hypertext documents are web pages and wherein said identifiers and web page addresses.

12. A digital television system comprising:

a display screen;

a tuner coupled to receive a digital television broadcast signal;

an intelligent controller coupled to said display screen and coupled to said tuner, said intelligent controller comprising a processor coupled to a bus and a memory unit containing instructions that when executed implement a method of displaying information comprising the steps of:

a) maintaining an intelligent filter that records hypertext documents that were previously accessed by a viewer of said digital television system;

b) monitoring datacast information decoded from said digital television broadcast signal to identify newly received hypertext documents;

c) storing into a cache memory any of said newly received hypertext documents that are recorded in said intelligent filter;

d) receiving, from a viewer, an identifier of a selected hypertext document; and

e) provided said selected hypertext document is located within said cache memory, accessing said selected hypertext document from said cache memory and displaying said selected hypertext document on said display screen.

13. A digital television system as described in Claim 12 wherein said datacast information comprises a domain of hypertext documents that are periodically broadcast.

14. A digital television system as described in Claim 13 wherein said method further comprises the step of f) provided said selected hypertext document is not located within said cache memory, obtaining said selected hypertext document upon its next occurrence within said datacast information and displaying said selected hypertext document on said display screen.

15. A digital television system as described in Claim 13 wherein said method further comprises the step of f) provided said selected hypertext document is not located within said cache memory, obtaining said selected hypertext document from a digital modem coupled to the word wide web and displaying said selected hypertext document on said display screen.

16. A digital television system as described in Claim 12 wherein said step a) comprises the steps of:

a1) receiving and recording identifiers of hypertext documents accessed by said viewer;

a2) recording a count associated with each identifier received by said step a1), said count indicating the number of times each recorded hypertext document was accessed by said viewer; and

a3) ranking said identifiers of said intelligent filter based on their associated counts.

17. A digital television system as described in Claim 16 wherein said step a) further comprises the step of a4) removing from said intelligent filter any recorded identifier of a hypertext document that has not been accessed by said viewer for a predetermined time period.

18. A digital television system as described in Claim 12 wherein said hypertext documents are web pages and wherein said identifiers and web page addresses.

19. A digital television system as described in Claim 12 wherein said step b) comprises the steps of:

b1) tuning said tuner to a selected channel within said digital television broadcast signal and receiving datacast information therefrom for a time period;

b2) identifying newly received hypertext documents from said datacast information of said step b1);

b3) provided said time period expired, updating said selected channel and initializing said time period; and

b4) repeating said steps b1) - b3).

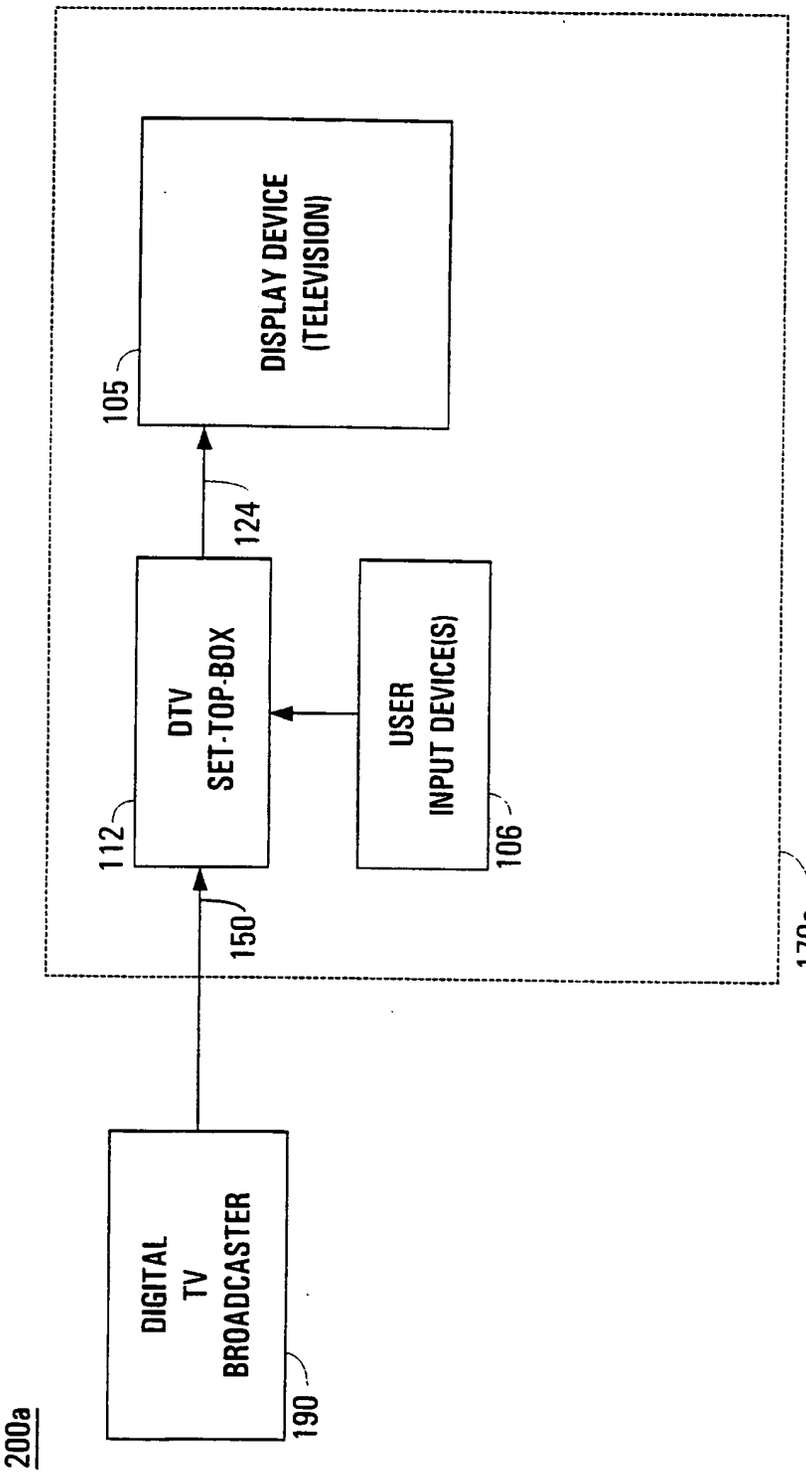
200a
DIGITAL TV BROADCASTER
190
150
DTV SET-TOP-BOX
112
USER INPUT DEVICE(S)
106
124
DISPLAY DEVICE (TELEVISION)
105
170a

FIGURE 1A

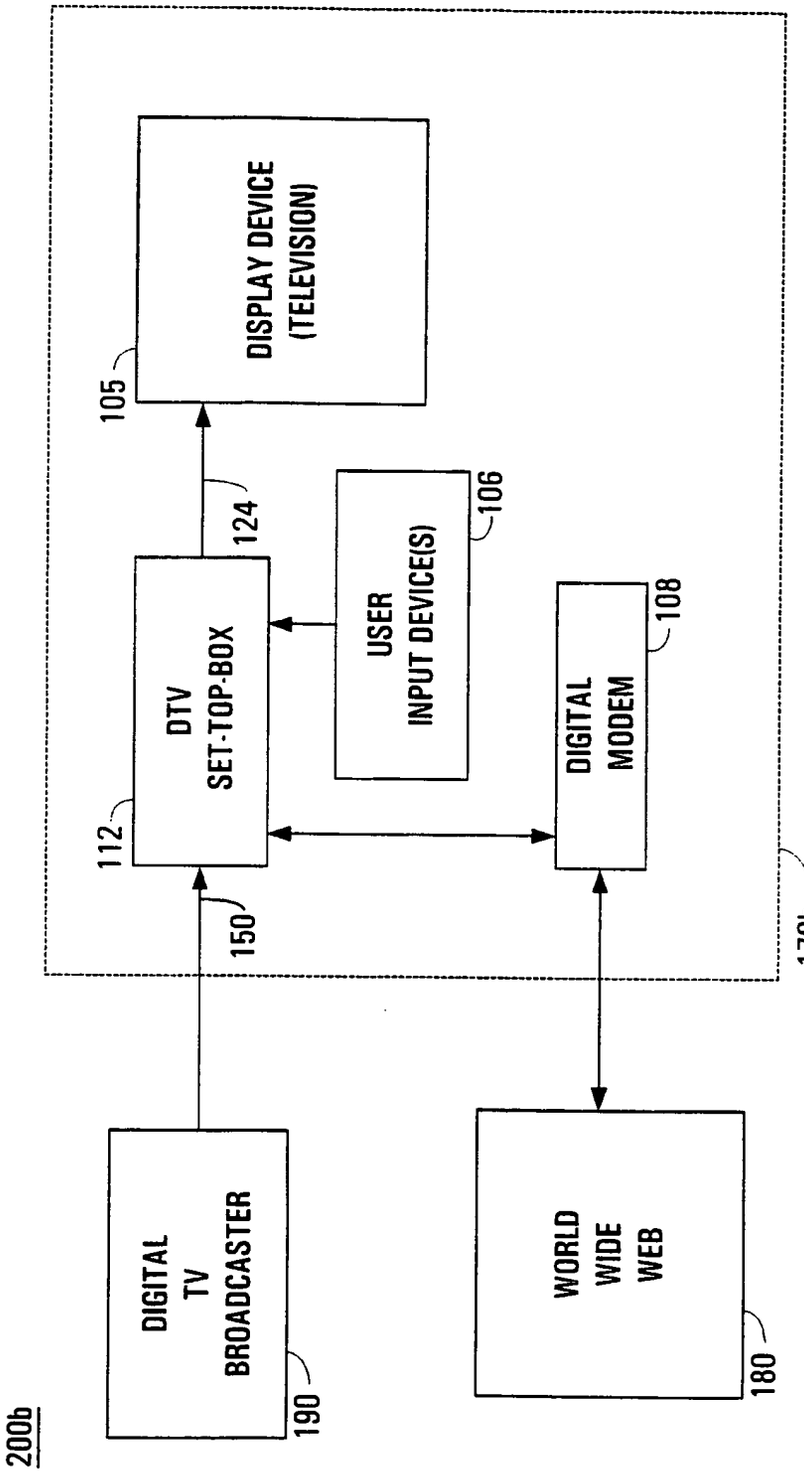
200b
DIGITAL TV BROADCASTER
190
WORLD WIDE WEB
180
DIGITAL MODEM
108
USER INPUT DEVICE(S)
106
DTV SET-TOP-BOX
112
DISPLAY DEVICE (TELEVISION)
105
150
124
170b

FIGURE 1B

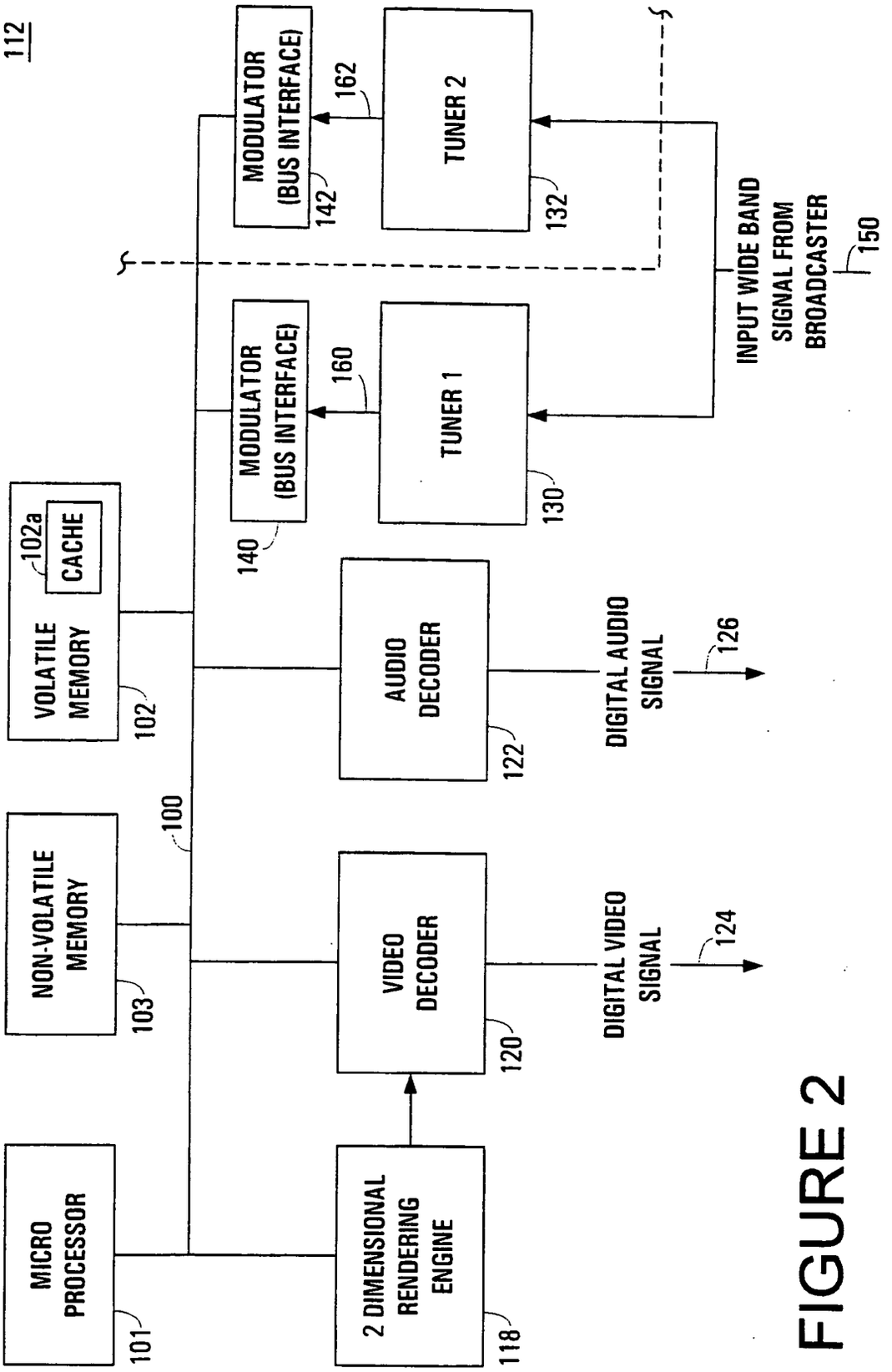
112
MODULATOR (BUS INTERFACE)
162
TUNER 2
142
132
INPUT WIDE BAND SIGNAL FROM BROADCASTER
150
MODULATOR (BUS INTERFACE)
160
TUNER 1
140
130
VOLATILE MEMORY
102a
CACHE
102
AUDIO DECODER
DIGITAL AUDIO SIGNAL
126
122
100
NON-VOLATILE MEMORY
103
VIDEO DECODER
DIGITAL VIDEO SIGNAL
124
120
MICRO PROCESSOR
2 DIMENSIONAL RENDERING ENGINE
101
118

FIGURE 2

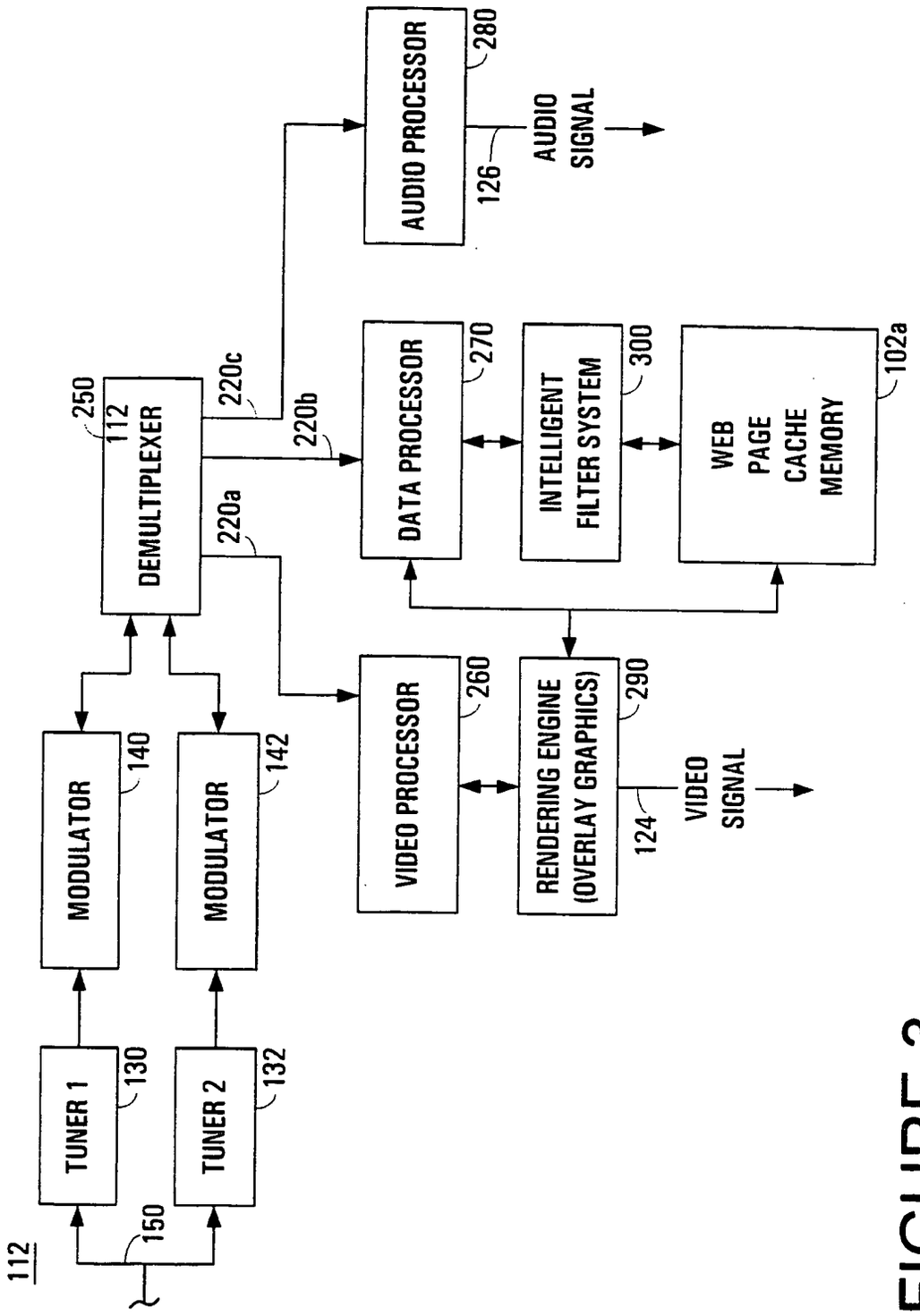
112
150
TUNER 1
130
TUNER 2
132
MODULATOR
140
MODULATOR
142
250
112
DEMULTIPLEXER
220a
220b
220c
VIDEO PROCESSOR
260
DATA PROCESSOR
270
RENDERING ENGINE (OVERLAY GRAPHICS)
290
INTELLIGENT FILTER SYSTEM
300
WEB PAGE CACHE MEMORY
102a
AUDIO PROCESSOR
280
126
AUDIO SIGNAL
124
VIDEO SIGNAL

FIGURE 3

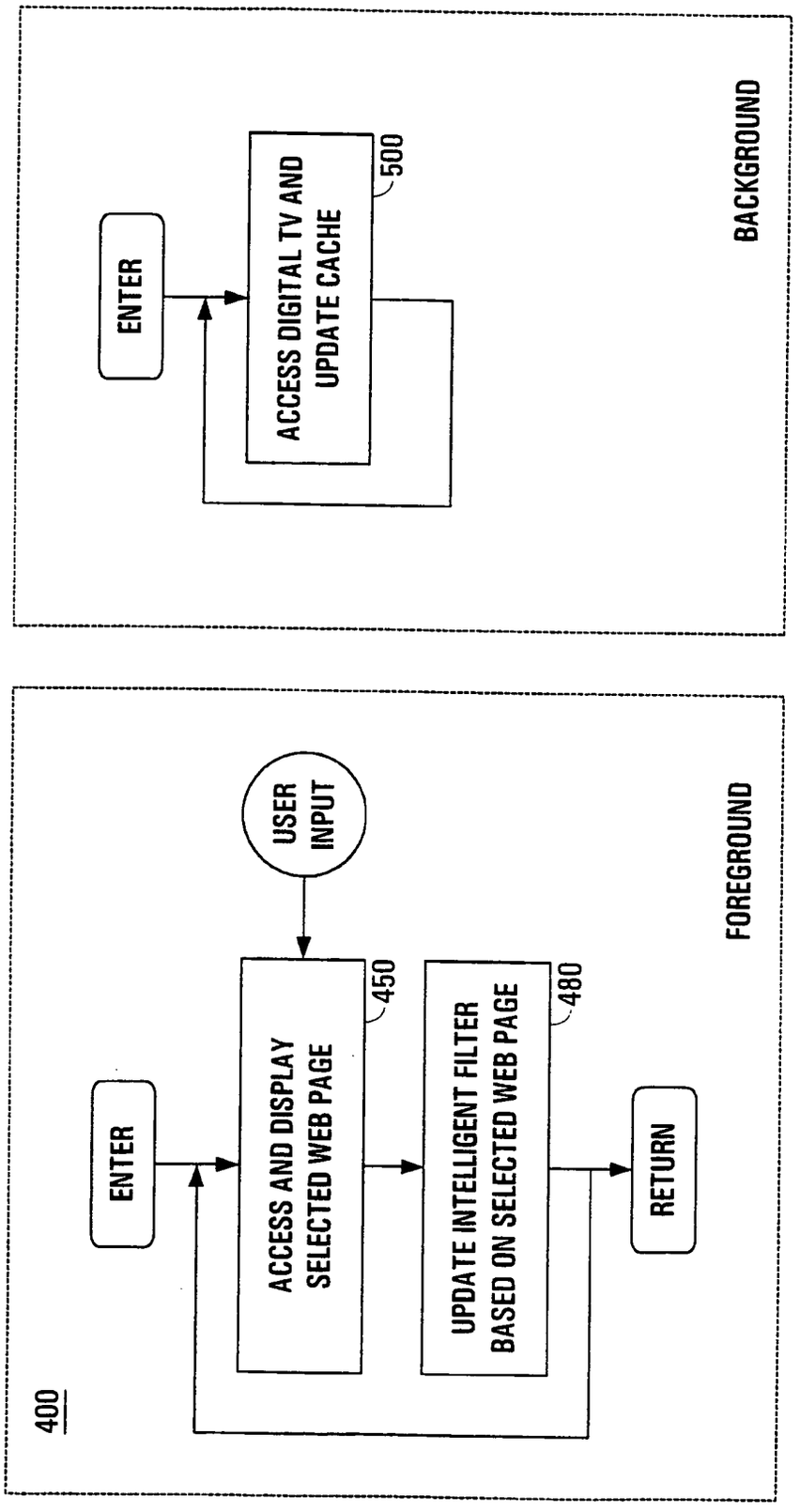
BACKGROUND
ENTER
ACCESS DIGITAL TV AND UPDATE CACHE
500
FOREGROUND
400
ENTER
USER INPUT
ACCESS AND DISPLAY SELECTED WEB PAGE
450
UPDATE INTELLIGENT FILTER BASED ON SELECTED WEB PAGE
480
RETURN

FIGURE 4

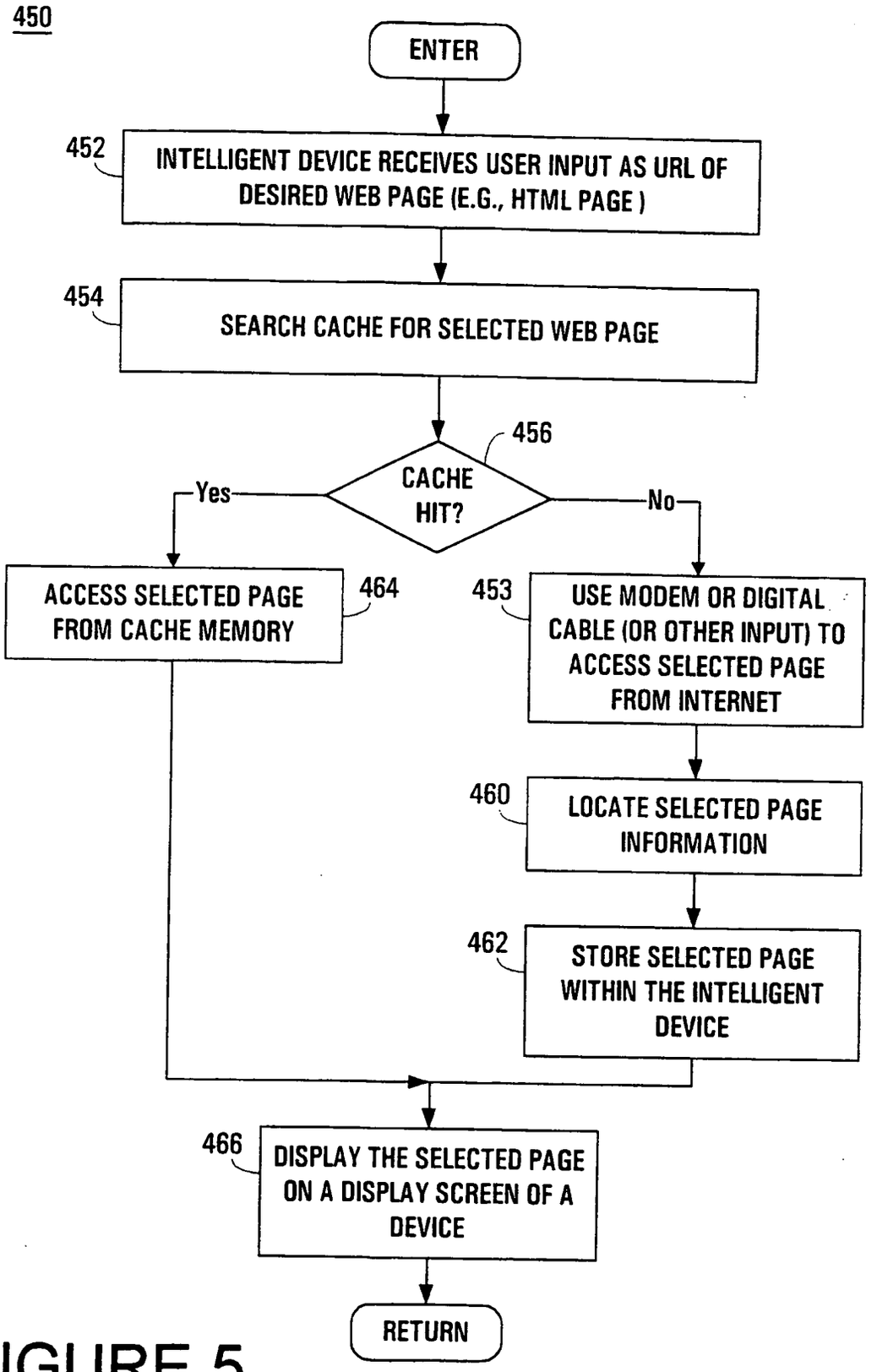
450
ENTER
452
INTELLIGENT DEVICE RECEIVES USER INPUT AS URL OF DESIRED WEB PAGE (E.G., HTML PAGE)
454
SEARCH CACHE FOR SELECTED WEB PAGE
456
CACHE HIT?
Yes
No
ACCESS SELECTED PAGE FROM CACHE MEMORY
464
453
USE MODEM OR DIGITAL CABLE (OR OTHER INPUT) TO ACCESS SELECTED PAGE FROM INTERNET
460
LOCATE SELECTED PAGE INFORMATION
462
STORE SELECTED PAGE WITHIN THE INTELLIGENT DEVICE
466
DISPLAY THE SELECTED PAGE ON A DISPLAY SCREEN OF A DEVICE
RETURN

FIGURE 5

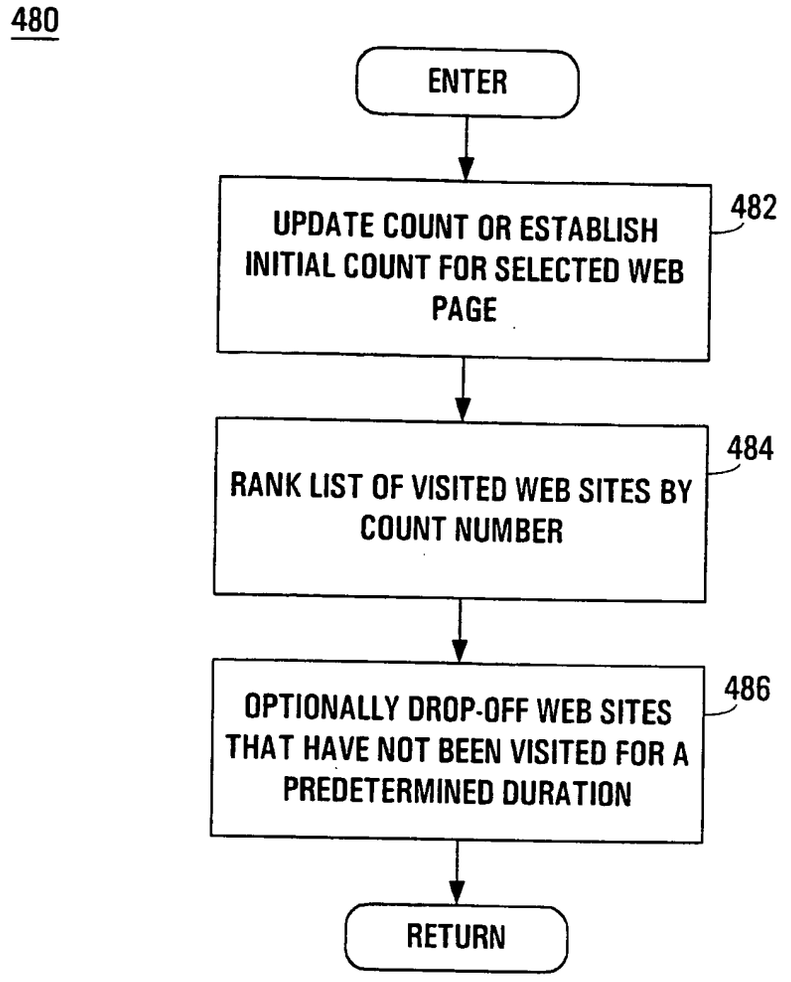
480
ENTER
UPDATE COUNT OR ESTABLISH INITIAL COUNT FOR SELECTED WEB PAGE
482
RANK LIST OF VISITED WEB SITES BY COUNT NUMBER
484
OPTIONALLY DROP-OFF WEB SITES THAT HAVE NOT BEEN VISITED FOR A PREDETERMINED DURATION
486
RETURN

FIGURE 6

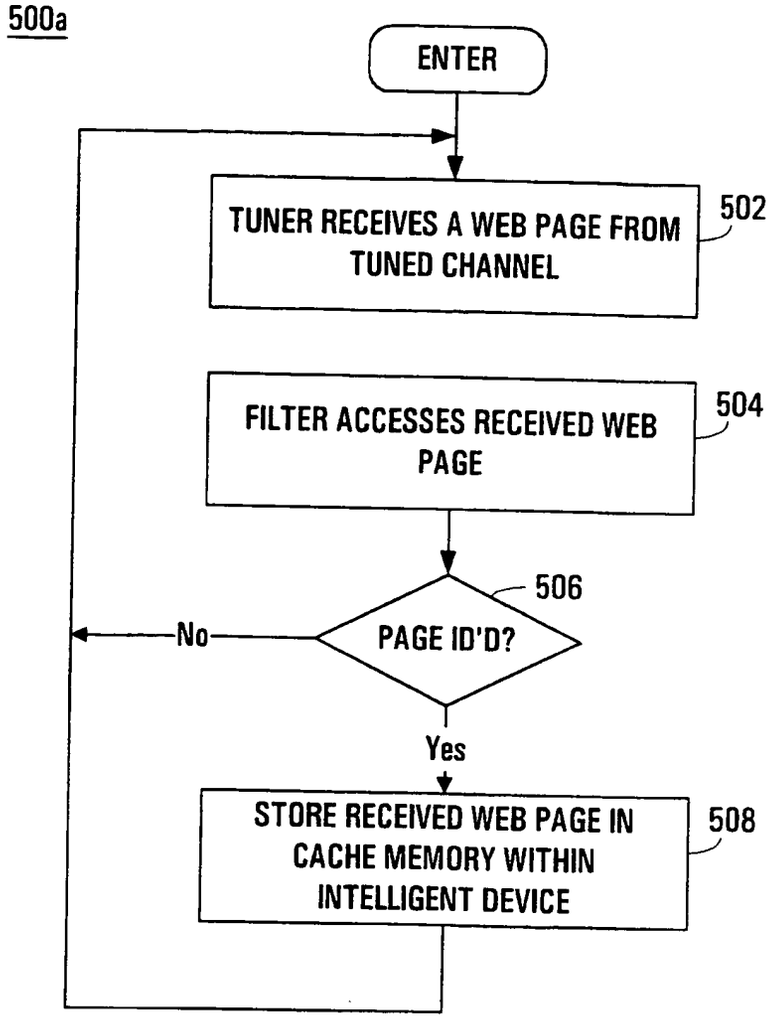
500a
ENTER
TUNER RECEIVES A WEB PAGE FROM TUNED CHANNEL
502
FILTER ACCESSES RECEIVED WEB PAGE
504
506
PAGE ID'D?
No
Yes
STORE RECEIVED WEB PAGE IN CACHE MEMORY WITHIN INTELLIGENT DEVICE
508

FIGURE 7A

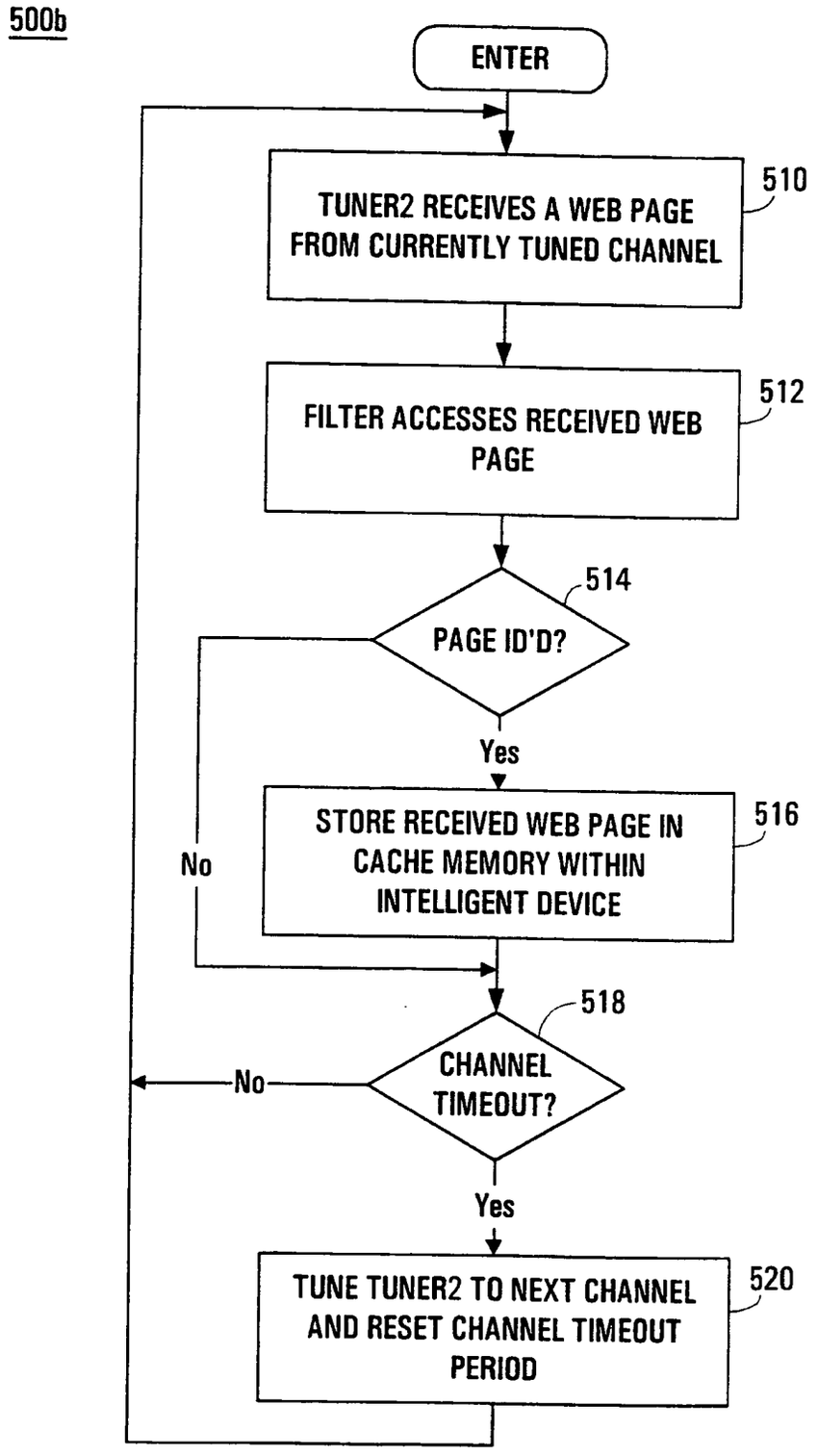
500b
ENTER
TUNER2 RECEIVES A WEB PAGE FROM CURRENTLY TUNED CHANNEL
510
FILTER ACCESSES RECEIVED WEB PAGE
512
PAGE ID'D?
514
Yes
No
STORE RECEIVED WEB PAGE IN CACHE MEMORY WITHIN INTELLIGENT DEVICE
516
CHANNEL TIMEOUT?
518
No
Yes
TUNE TUNER2 TO NEXT CHANNEL AND RESET CHANNEL TIMEOUT PERIOD
520

FIGURE 7B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29595

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :HO4N 7/10, 7/14; HO4H 1/00, 1/02
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. : 709/217; 345/327; 348/12, 13, 6, 10; 455/3.1, 3.2, 5.1, 6.1, 6.2, 6.3

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)

APS - DTV, set-top, user, preferences, habits, web pages, internet, HTML

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 5,929,850 A (BROADWIN et al) 27 July 1999, col. 10, line 8 - col. 12, line 46, col. 6, lines 22-27, col. 13, lines 33-42, col. 15, lines 1-67, fig. 1, fig. 2	1-3, 5-7, 10, 12-18
Y, P	US 5,889,951 A (LOMBARDI et al) 30 March 1999, col. 27, lines 10-36	2, 3, 7, 10, 16, 17
Y	US 5,727,129 A (BARRETT et al) 10 March 1998, col. 5, lines 22-46, col. 9, lines 4-16	12-18

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
04 APRIL 2000	10 MAY 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer For Eugene Eogan VIVEK SRIVASTAVA Telephone No. (703) 305-4038

Form PCT/ISA/210 (second sheet) (July 1998) *

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29595

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,701,161 A (WILLIAMS et al) 23 December 1997, col. 5, line 65 - col. 6, line 19	5, 6, 10
A, P	US 5,895,471 A (KING et al) 20 April 1999, ALL	1-19
A, P	US 5,978,828 A (GREER et al) 02 November 1999, ALL	1-19

Form PCT/ISA/210 (continuation of second sheet) (July 1998) ★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29595

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 8, 9, and 11
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29595

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

709/217; 345/327; 348/12, 13, 6, 10; 455/3.1, 3.2, 5.1, 6.1, 6.2, 6.3

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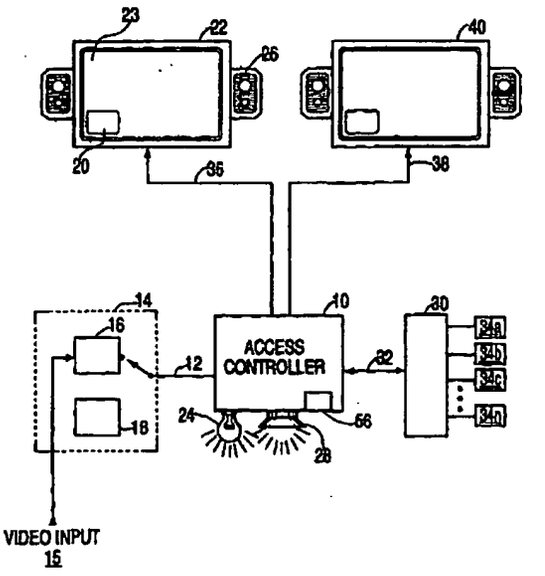
(54) Title: MEDIA ONLINE SERVICES ACCESS SYSTEM AND METHOD

(57) Abstract

A system is disclosed for providing direct automated access to an online information services provider (34a, 34n) through an address embedded in a video or audio programm, commercial message, or news story. The system operates with video or audio programs (15) which are received through broadcast, cable or pre-recorded media, and which are encoded in either analog or digital formats. The address of an online information provider is encoded in a vertical blanking interval or other non-displayed portion of an electronic signal which represents the video or audio program so as not to interfere with the programs as displayed or transduced on a television or audio sound system (22, 40). The online information provider address is detected and decoded from the electronic signal and used in establishing a direct digital communication link to the online information provider (34a, 34n).



MEDIA ONLINE SERVICES ACCESS SYSTEM AND METHOD

The present invention relates to an electronic information access system and more specifically to a media online services access system which provides direct, automated access to an online information provider through an address embedded in an electronic signal which carries a program segment (e.g., through television, radio, or a pre-recorded video or audio medium).

BACKGROUND OF THE INVENTION

Heretofore, media receiving and display systems such as television and radio receivers have been linked to interactive information providers in only very limited ways. Some systems exist which permit the exchange of digital information with the viewer of a television program over or in combination with a television signal, but such systems have provided access to a single information source available from, for example, the broadcast or cable television operator. In such systems, the selection of information services has been entirely within the control of the broadcast or cable television operator. At the same time, some television and radio broadcasters have begun announcing an Internet address for viewer inquiries during the course of program transmission. Access to this Internet address requires the user to utilize his or her computer. No system yet exists which provides automated and direct user access to online information providers through an address embedded in a video or audio program signal.

The recent explosion in the usage of online information services through digital networks such as the Internet, Prodigy (R), America Online (R) and Compuserve (R), for example, indicate that the demand for access to readily available up-to-date or detailed information is increasing. The viewer of a video program, whether the program is received through

broadcast, or cable means or from a pre-recorded medium, may often seek to discover more information which relates to a topic presented in the video program. Since television programs and recordings are of finite length, they do not contain all the related information which a consumer may wish, and the information contained therein may not be timely. Therefore, it would be desirable for there to be a system which automatically and directly provides access to an online information provider through an address which can be extracted from an audio or video program such as a television program, commercial or news story. With such system, several benefits would be obtained. For example, adults and children viewing an educational or historical video program could easily locate additional materials provided in text or still picture by the producers of the video program by accessing more information from the producers digitally through the online address. Consumers seeking more information about a specific advertised product could easily find such information by accessing the online address of an information provider designated by the advertiser. News program viewers seeking specific information from news stories or more detailed information could easily access such information through an online information provider designated by the producers of such program.

The online services access system could be used to provide still other benefits to consumers, business owners, and the government. For example, an automobile manufacturer could make information available directly to a consumer through an online address embedded in a video presentation so the consumer could reach its online site quickly to ask for more information, to request a test drive, or to purchase parts. Through such system, a grocery store could advertise and receive orders through its online site from customers for home delivery, or for other shopping needs. A catalog

retailer could use such system to provide rapid access to consumers, after airing a commercial, to its catalog in online form and to enable orders to be placed readily through its online site. A record company could use such system to enable customers to order a recording while listening to a song or viewing a music video. Government agencies, e.g., the Internal Revenue Service, military recruiters, or health agencies, for example, could use such system to provide consumers with readily available information following the airing of public service announcements regarding regulations, programs, or public health concerns, e.g., cancer, AIDS, and heart disease. Educators and students could use such system to obtain more detailed or up-to-the-minute information from online bulletin boards and databases regarding topics presented in a video program, even though the program was recorded some time in the past.

Systems exist at present in which digitally encoded information is transmitted and received through a modified video signal of a conventional television transmission. For example, a system is described in U.S. Patent No. 4,894,789 wherein a digital information signal is transmitted during the vertical blanking interval of an analog broadcast television signal and decoded and displayed on the television screen in addition to the analog broadcast video signal.

U.S. Patent No. 5,128,752 describes a system in which a retailer broadcasts information for reception upon a conventional television set regarding products available through a central location. The system includes a decoder for displaying the product information on the television screen, and also a token generator for producing tokens, at the user's option, to be redeemed when a product is purchased. The broadcast information includes data related to token redemption and value considerations available upon purchase of the product.

U.S. Patent No. 5,285,278 describes a system in which coupon-related digital information is received from a transmitted television signal through a decoder. The decoder records the coupon-related data for later readout and redemption when a product is purchased.

U.S. Patent No. 4,905,094 ("the '094 Patent") describes an interactive cable television system in which a subscriber tunes to a channel and requests connection to a remote location by either dialing a predetermined telephone number or accessing a cable television channel. When the system identifies the subscriber the television set displays the frame of video (and possibly accompanying audio information) describing products or services which may be viewed and purchased. The '094 Patent does not describe the extraction of encoded address information from the television signal, or a system enabling a television program viewer to access online information providers by establishing connection automatically through such extracted address.

Thus, systems exist which are capable of providing interactive user access through a broadcast or cable television signal. However, such systems are limited in the access they provide to information sources directly available through the unitary cable or broadcast provider. By contrast, the present invention facilitates direct automated user access to an unlimited number of online information providers through provider addresses which are embedded in the electronic signal which carries an video or audio program.

Accordingly, it is an object of the invention to provide a system for extracting an address of an online information provider from an electronic signal which carries an video or audio program.

It is a further object of the invention to provide a system which indicates to the program user (i.e., viewer or listener), after extracting an online

information provider address, that more information is available.

Still another object of the invention is to provide an automated system which, upon receipt of a single user command, directly and automatically establishes a digital connection with an online information provider through an address extracted from an electronic signal which carries a video or audio program.

Another object of the invention is to provide a system which converts information signals received from an online information provider to a form capable of being displayed on a conventional reproducing system such as a television set.

These and other objects are provided by the media online services access system of the present invention.

SUMMARY OF THE INVENTION

The media online services access system of the present invention provides a system and process which links video and audio program content with online information signal content. The system provides heretofore unattained direct automated user access from a media program such as a received or pre-recorded television or radio (audio) signal to an online information provider through a link provided in the media program. The access system receives an electronic signal representing a video or audio program or a combined audio/video program from an available medium (e.g., broadcast and cable television and radio, or a pre-recorded medium such as a tape or disc). Embedded in the electronic signal, for example, in the vertical blanking interval, or otherwise encoded in the electronic signal in such manner as not to interfere with the displayed image, is an information signal representing an electronic address of an online information provider. The online information provider

can be any one of millions of interactive information providers which can be accessed through exchange of digital information signals, for example, a publisher who is available through the Internet for interactive transactions.. As the media program is received for reproduction on a video display or audio sound system, the access system extracts the embedded electronic address for use in directly accessing the online information provider at the selection of the user.

Preferably, the address is stored at the time of extraction, for use in accessing the online information provider at the selection of the user. The duration in which an extracted signal address is stored may be relatively short, as in the case where the address is transmitted and refreshed continuously or at very short intervals, e.g., once per each frame of a video signal, or it may be longer, as when an address is transmitted only at selected intervals of a program.

Upon successfully extracting an electronic address, the access system provides a indicator signal to the user that more information is available. The indicator signal may take the form of a message displayed on a video screen, or other indicators such as a light, a sound or a wireless tactile indicator, e.g., vibrating wristband or clip-on unit. Alternatively, the video or audio program may contain a logo or message to be displayed for the user at points in the program which coincide with the presence of an embedded online information provider address, which, in such case, would eliminate the need for the access system to incorporate specific structure to provide indication to the user, in response to successful extraction of an online provider address.

After receiving the indicator signal, if the user desires more information, the user may request access to the online information provider through a command to the access system, e.g., through pushbutton,

user control keypad, voice command, mouse, touchpad, touchscreen, or other such input. Upon receiving such command, the access system automatically establishes a digital communication link with the online information provider through transmission of a signal containing the extracted address. Preferably, upon establishment of such communication link, the access system enables interactive communications with the online information provider.

In another embodiment of the invention, the extracted address can be used without first being stored, as in cases where a connection already exists between the access system and a network. Where such connection exists, the access system provides an indicator signal to the user upon successful extraction of an online information provider address. However, in this embodiment, the access system waits to receive a user command to initiate access, and only after receiving such command does the access system extract the next received address from the electronic signal and use it to establish a direct connection to the online information provider.

In a preferred embodiment, after accessing an online services provider, the access system receives information from the online information provider and processes it for reproduction on a video or audio reproducing system. For example, the information can be displayed on the television screen in place of the television broadcast signal, on a separate computer monitor or other display device, or together with the television broadcast signal in a picture-in-picture format. In this way, the user can fully explore all of the related information available from the online information provider. Preferably, the access system is provided with hardware to reformat the received information signal for display upon an otherwise incompatible system, for example, to convert a digitally

encoded video signal to an analog signal for reproduction on a conventional television set. Preferably, the access system is also provided with hardware for receiving and processing user commands for transmission to the online information provider for providing user communication transactions with the provider.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block and schematic diagram illustrating the online services access system in accordance with the present invention.

FIG. 2 is a block and schematic diagram of an access controller used in the online access system of FIG. 1.

FIG. 3 is a block and schematic diagram of another embodiment of an access controller used with a computer in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An online services access system according to the present invention is illustrated in FIG. 1. Referring to FIG. 1, the online services access system includes access controller 10 which incorporates all components necessary to provide online access and to access received online information signals. Access controller 10 is constructed to receive an electronic signal 12 from a broadcast, cable or prerecorded medium program in conventional form from a video signal source 14. Video signal source 14 can be selectively switchable to provide output from a channel selector 16 connected to a cable or broadcast video input 15 or from a video playback system 18 which may be, for example, a videocassette recorder or an analog or digital videodisc device. It will be appreciated that channel selector 16 may be provided in a unit separate from playback system 18, or within access controller 10 itself. Alternatively, access controller 10 can be constructed to receive and decode program signals at radio frequency

as received from a broadcast or cable video source, or as downconverted to baseband, by for example, the front end receiving circuitry of a video cassette recorder or digital video disc device. It will also be appreciated that the function and results provided by access controller 10 are not dependent upon which of many available playback systems is connected thereto, whether such systems are analog or digital in format, or whether such playback systems operate upon videotape, audiotape, or disc media.

Access controller 10 is connected via a primary output signal line 36 to a conventional reproducing system 22 such as a television set, and is optionally connected through a second output signal line 38 to a high resolution reproducing system 40, such as a computer monitor. In addition, access controller 10 is connected to a public or private network 30 through an information signal carrier 32, e.g., telephone line, coaxial cable, fiber optic link, cellular, radiotelephone, or satellite link. Network 30, which may be any private or public local area network or wide area network such as an office network, company network, public Internet or circuit-switched network is used to route address and information signals between access controller 10 and a selected one of a plurality of online information providers 34a, 34b, 34c, . . . 34n. Access controller 10 receives from the online information provider, through network 30, information signals having a video or audio program content and selectively provides, through appropriate conventional processing, a conventional program signal or a high resolution signal for reproduction upon standard reproducing system 22, or high resolution reproducing system 40, respectively.

The internal construction of access controller 10 is described with reference to FIG. 2. Access controller 10 is provided with an address extractor 42

which receives the electronic signal 12. Address extractor 42 includes hardware and/or software to detect, decode and store an address which has been embedded in a video or audio program signal. Among the ways which exist to detect an address signal transmitted in conjunction with an analog video signal, address extractor 42 may be constructed to detect a digital address which is transmitted during a vertical blanking interval or other portion of a conventional video signal in such manner that displayed image quality is not affected. For example, the address signal can be transmitted during a portion of a video signal such as in the vertical interval, in sync or through changes in the luminance or chroma signals. Address extraction 42 is constructed to electronically store, e.g., via a register or memory device (not shown), the detected address for use in accessing the online services provider at the selection of the user. The address signal may be transmitted at very short intervals, e.g., once for each frame of a video program such that storing and refreshing of the extracted address signal occurs at very short intervals. Alternatively, the address signal may be transmitted at longer intervals, i.e., at discrete intervals in a program such that the duration in which an extracted address signal is stored is much longer.

In such cases in which video or audio program is encoded digitally, address extractor 42 may be constructed in any of several existing ways to detect an address signal which is received in conjunction with a digitally encoded video or audio electronic signal 12. The details of the construction of address extractor 42 are well known in the art and need not be described in further detail.

Address extractor 42 has an output connection to an indicator signal generator 46. The indicator signal generator 46 signals the user that more

information relating to the program is available, such information being accessible through an electronic address when address extractor 42 has decoded such address from the electronic signal 12. Indicator signal generator 46 causes, for example, a video image 20 (e.g., picture within picture, logo, or icon) to be displayed with the video program signal on reproducing system 22 to signal the user that an address of an online provider has been stored and that additional information is available. Instead, or in addition to such visual display, indicator signal generator 46 may signal the user by activating a light 24 or other visual indicator located on an exterior panel of access controller 10 or of reproducing system 22. Alternatively, indicator signal generator may cause a sound to be produced on a speaker 26 of reproducing system 22, or by a speaker 28 provided in access controller 10. Here again, the design of indicator signal generator 46 is well known in the art.

Access controller 10 is provided with a user input interface 56 for receiving a user command which automatically initiates establishment of a direct digital communication link to an online information provider through an address detected from the electronic signal 12 by address extractor 42 and permits interactive communication between the user and the online information provider. It will be appreciated that many conventional input interfaces are well suited for use as user interface 56 because of their compatibility with conventional television and audio sound systems. Among such input interfaces are infrared, radio and audio frequency interfaces which decode single key or multiple key sequence input from a wired or wireless remote user control. Preferably, user input interface 56 detects when a special purpose button on a remote user control has been pressed and provides a responsive signal which automatically causes the stored

address of the online provider to be retrieved and transmitted. User input interface 56 can also be constructed to detect when a special sequence of keys has been pressed on a conventional user control (e.g., a sequence such as "ENTER," "ENTER," "+VOLUME") and to enable interactive communication with the online information provider. Alternatively, user input interface 56 can be implemented by any appropriate microcomputer type user interface, e.g., mouse, touchpad, touchscreen, trackball, joystick, pushbutton, eraser head, or other such device. Preferably, user interface 56 is constructed to provide and receive transmission of digital information signals through modem 54 to the online information provider, thereby enabling interactive user access with the online provider for conducting detailed information searches, conducting transactions, and sending or posting messages to the accessed provider.

Access controller 10 is provided with a modem 54 for transmitting and receiving digital information signals between access controller 10 and public switching network 30 through an information signal carrier line 32. Modem 54 demodulates incoming information signals and outputs them to processor 58 which extracts a video and/or an audio signal 38. Preferably, access controller 10 includes a signal converter 62 for adjusting or converting an incompatible signal for display upon conventional reproducing system 22, such as a television set, either in place of the television signal, superimposed over the television signal, or in picture-in-picture format, as controlled by the user. Alternatively, processor 58 provides the video signal on line 38 to a high resolution reproducing system 40, such as a computer monitor. Indicator signal generator 46 may also incorporate a switch (not shown) which automatically switches off the primary output signal 36 whenever a signal appears at the output of

signal converter 62. In this manner, information signals received from online information providers will be automatically displayed on conventional reproducing system 22 in place of the ordinarily displayed video signal 36. Processor 58 can also receive the input video or audio electronic program signal through a line 55 output from address extractor 42 (although direct connection of the electronic signal line 12 is possible). In this manner, processor 58 may be constructed to operate upon the video or audio signal in conjunction with information signals received from an online information provider to generate a "picture within picture" signal for display upon conventional reproducing system 22.

The operation of the system will now be described. An electronic signal 12, such as a signal from a video or audio program from channel selector 16 or playback system 18, e.g., prerecorded videotape, or an analog or digital video disc, containing an embedded signal representing the electronic address of an online information provider in the blanking interval or other non-displayed portion of the electronic signal 12 is received by address extractor 42. From the electronic signal 12, address extractor 42 detects, decodes and stores a digital address of the online services provider, if any such address is embedded therein. If an address is successfully decoded and stored, address extractor 42 activates, through signal line 44, indicator signal generator 46. Indicator signal generator 46 then produces an indicator signal and overlays or encodes it onto a conventional program signal 36 to be displayed or transduced by conventional reproducing system 22. Alternatively, indicator signal generator 46 produces a signal on line 50 which activates a special purpose indicator, e.g., illuminating a light 24 or producing a sound on a speaker 28 of access controller 10.

If the user wants to access the online information provider, the user gives such command to access controller 10 by, for example, pushing a special button on his or her remote control device. The remote control device transmits a command signal to user interface 56 which receives the command signal. User interface 56 in turn, produces a signal which is applied to address extractor 42 to retrieve the stored address of the online information provider. Under appropriate software or hardware control, the address is transmitted via modem 54 over network 30 to an online information provider, e.g., 34c.

Once access to the online information provider has been established, access controller 10 can automatically receive digital information signals through modem 54 from the online information provider. Received information signals are operated upon by processor 58 for displaying upon conventional TV reproducing system 22 or high resolution reproducing system 40, e.g., a computer monitor or other display device. Preferably, received signals which are incapable of being directly displayed upon conventional reproducing system 22, e.g., a conventional television set, are converted by a signal converter 62 for display thereon. Information signals received from an online information provider may be displayed as still or moving images in place of the ordinarily displayed video signal on the conventional reproducing system 22, or may be displayed as part of a "picture within picture" display in conjunction with the ordinarily displayed video signal on conventional reproducing system 22 or on the computer monitor 40 or other display device.

After access has been established, user commands received through user interface 56 are transmitted as information signals through modem 54 to the online information provider, thereby providing interactive user access with the online provider and

enabling searching for detailed information, conducting transactions, sending or posting messages to the accessed provider and any other actions that can ordinarily be conducted through an online connection.

Another embodiment of the invention is illustrated in FIG. 3. FIG. 3 shows an embodiment which operates in conjunction with an available computer 164. In this embodiment, access controller 110 does not require an internal processor or modem because such functions are provided by a computer 164 attached thereto. In addition, computer 164 also provides a monitor and audio reproducing components which function as high resolution reproducing system 40. Address extractor 142, indicator signal generator 146, and user input interface 156 of access controller 110 are connected through an output interface 166 for providing decoded address output, indicator signals, and user commands, respectively, to computer 164. In other respects, access controller 110 is connected to receive an electronic signal 12 and provide a conventional program signal 122 and a signal 150 to indicator 124 or indicator 128, in like manner as in the self-contained embodiment of access controller 10 described in the foregoing (FIG. 2). It will be appreciated that the computer supported embodiment of the invention (FIG. 3) provides the same function and operates in essentially the same manner as the self-contained embodiment (FIGS. 1-2) and need not be described in any further detail.

In still another embodiment of the invention, with reference to FIGS. 1-3, a connection to network 30 is maintained continuously by access controller 10 through modem 54 or the modem provided in computer 164. This embodiment will be described with reference to the access controller 10 shown in FIG. 2, although the skilled person in the art will readily understand the structural modifications required for operation in accordance with the access controller shown in FIG. 3.

In this embodiment, address extractor 42 detects and decodes an online information provider address embedded in the video or audio program signal, but does not store the address.

As described in the foregoing embodiments of the invention, address extractor 42 provides a signal to indicator signal generator 46 when it successfully detects an online information provider address in the electronic signal. Address extractor 42 detects and decodes the embedded address and passes it to modem 54. Modem 54, in turn, only uses the extracted address if it has first received a user command to initiate access to the online information provider. It will be appreciated that this embodiment of the invention can be used with a video or an audio program signal wherein the online information provider address is frequently or continuously transmitted. Modem 54 is provided with hardware and/or software to automatically establish, upon receiving a user command to initiate online access, a direct digital communication link with the online information provider associated with the next received online information provider address.

As an example of the operation of this non-address storing embodiment of the invention, a video or an audio program signal having a frequently transmitted embedded signal containing an online information provider address is received through line 12 by address extractor 42. Address extractor 42 detects and decodes the online information provider address, but does not store it before passing it to modem 54. Modem 54 does nothing with the online information provider address unless a user command to initiate access has first been received from user interface 56. If such user command has been received, modem 54 transmits a signal over network 30 using the next received address to establish a digital communication link with the online information provider. The function and operation

of the non-address storing embodiment is otherwise the same as in the other described embodiments of the invention and need not be described in any further detail.

In yet another embodiment of the invention, automated direct user access to online information providers is achieved without incorporating an indicator signal generator 46, 146 (FIG. 3) into the access controller 10. In this embodiment, the video or audio program as produced incorporates a visual or auditory indicator, such as a logo or message, which is automatically displayed or sounded by conventional reproducing system 22 and/or high resolution reproducing system 40 during portions of the program when an online information provider address is present in the underlying electronic program signal. Through the visual or auditory indicator, the user is made aware of the availability of the online information provider address. Therefore, in this embodiment of the invention, address extractor 42 may be constructed and used in a manner so as to detect and decode an embedded online information provider address only after receiving a user command to initiate access to the online information provider. The skilled person in the art will appreciate that this embodiment of the invention operates in other respects as in the other embodiments of the invention described in the foregoing and need not be described in further detail.

While the invention has been particularly described and illustrated with reference to preferred embodiments thereof, it will be understood by those skilled in the art that changes in the above description or illustration may be made with respect to form or detail without departing from the spirit and scope of the invention.

WHAT IS CLAIMED IS:

1. A method of providing to a user of online information services, at the time of viewing a video program represented by an electronic signal, direct digital communication access to an online information provider through a link provided in said video program, comprising:

electronically extracting an address associated with an online information provider from an information signal embedded in said electronic signal;

indicating to the user that an address has been extracted permitting communication with an online information provider; and

automatically using said extracted address, in response to a user initiated command, to establish a direct digital communication link with the online information provider associated with said extracted address.

2. The method in accordance with Claim 1 further comprising using said direct communication link to provide interactive exchange of information between said online information provider and the user.

3. The method in accordance with Claim 1 wherein said step of indicating includes producing a visual indication to be displayed on the system wherein said program is displayed.

4. The method in accordance with Claim 1 wherein said step of indicating includes producing an auditory indication to be sounded on a speaker where an audio portion of said program is reproduced.

5. The method in accordance with Claim 1 wherein said step of indicating includes activating a sensory indicator on a system separate from that on which said program is reproduced.

6. The method in accordance with Claim 1 wherein said step of indicating further includes indicating that more information relating to the content

of said video program is available through said extracted address.

7. A method of providing online information services to a user of such online services, comprising the steps of:

providing an audio or video signal having an embedded information signal representing the address of an online information provider;

extracting and storing the address of said online information provider from said audio or video signal;

automatically using said stored address, in response to a user initiated command, to transmit a signal to connect said user with the online information provider associated with said stored address; and

receiving online information signals from said online information provider.

8. A method of providing to a user of online information services, at the time of viewing a video program represented by an electronic signal, direct digital communication access to an online information provider through a link provided in said video program, comprising:

indicating to the user that an address is available for extraction from said electronic signal which permits communication with an online information provider;

automatically electronically extracting, in response to a user initiated command, an address associated with an online information provider from an information signal embedded in said electronic signal, and using said extracted address to establish a direct digital communication link with the online information provider associated with said extracted address.

9. A media online services access system for providing to a user of online information services, while viewing or listening to a video or audio program

represented by an electronic signal, a direct digital communication link with an online information provider through a link provided in said electronic signal, comprising:

electronic detecting means for extracting an address associated with an online information provider from an information signal embedded in said electronic signal;

means for indicating to the user that an address has been extracted which permits communication with an online information provider; and

means responsive to a user initiated command for automatically establishing a direct digital communication link with the online information provider associated with said extracted address.

10. The media online services access system in accordance with Claim 9 wherein said program is a video program, further comprising:

means for receiving an information signal from said online information provider; and

means for displaying an image signal detected from said received information signal.

11. The media online services access system in accordance with Claim 9 wherein said indicating means comprises a visual indicator displayed on a system on which said program is displayed.

12. The media online services access system in accordance with Claim 9 wherein said program is an audio program.

13. The media online services access system in accordance with Claim 9 further comprising a user control device coupled to said system to permit said user to interactively communicate with said online information provider.

14. The media online services access system in accordance with Claim 9 wherein said means further includes means for indicating that more information

relating to the content of said video program is available through said extracted address.

15. A media online services access system for providing to a user of online information services, while viewing or listening to a video or audio program represented by an electronic signal, a direct digital communication link with an online information provider through a link provided in said electronic signal, comprising:

means for extracting and storing an address associated with an online information provider from an information signal embedded in said electronic signal;

means for indicating to the user that an address has been extracted which permits communication with an online information provider; and

means responsive to a user initiated command for automatically establishing a direct digital communication link with the online information provider associated with said stored address.

16. The media online services access system in accordance with Claim 15 wherein said means further includes means for indicating that more information relating to the content of said video program is available through said extracted address.

17. A media online services access system for providing to a user of online information services, while viewing or listening to a video or audio program represented by an electronic signal, a direct digital communication link with an online information provider through a link provided in said electronic signal, comprising:

means for indicating to the user that an address is available for extraction from said electronic signal which permits communication with an online information provider; and

means responsive to a user initiated

command for extracting an address associated with an online information provider from an information signal embedded in said electronic signal, and for automatically establishing a direct digital communication link with the online information provider associated with said extracted address.

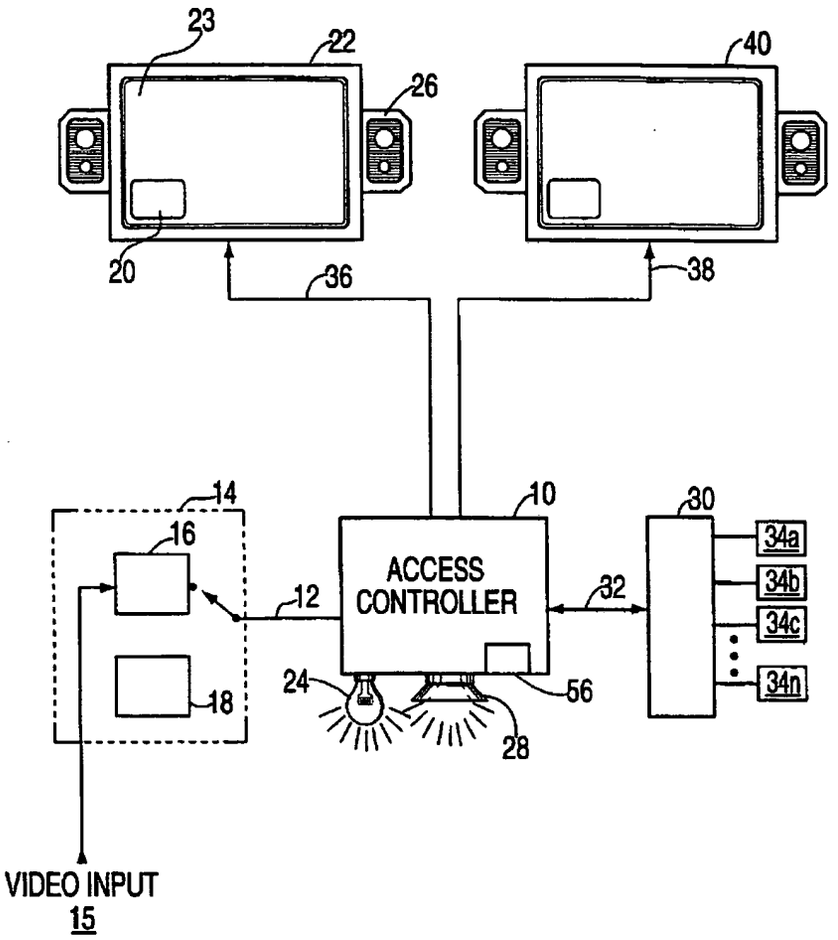

23
22
26
40
20
36
38
14
16
10
30
ACCESS
CONTROLLER
12
32
34a
34b
34c
34n
18
24
56
28
VIDEO INPUT
15

FIG. 1

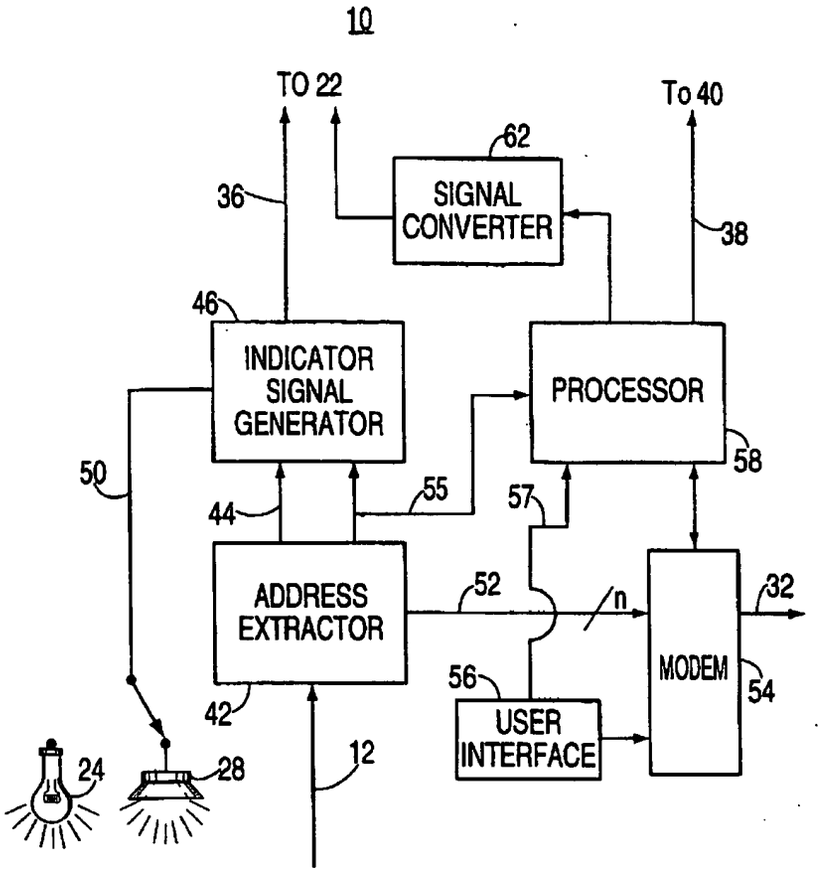

10
TO 22
To 40
62
SIGNAL CONVERTER
36
38
46
INDICATOR SIGNAL GENERATOR
PROCESSOR
58
50
55
57
44
ADDRESS EXTRACTOR
52
n
32
MODEM
54
56
USER INTERFACE
42
12
24
28

FIG. 2

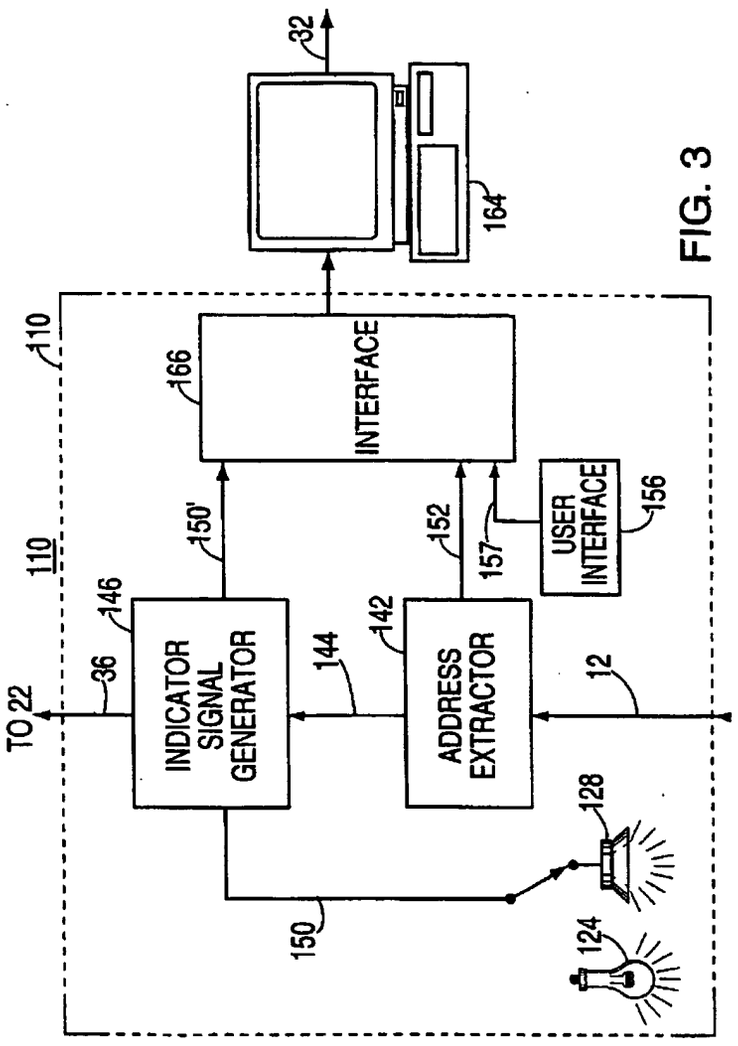

32
164
110
166
INTERFACE
USER INTERFACE
156
157
152
150'
110
146
INDICATOR SIGNAL GENERATOR
142
ADDRESS EXTRACTOR
144
36
TO 22
12
128
124
150

FIG. 3

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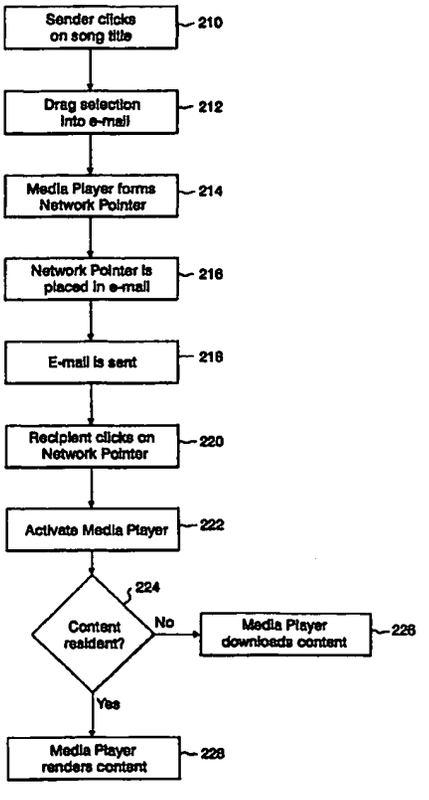
(57) Abstract

A method for transmitting or distributing media information using Handle data structures (100) in e-mails or chat sessions. When a user sends a Handle (100) by e-mail (218) or active chat session to another user, the recipient is able to access the same media the sender accessed over the network. The Handle (100) can be used to govern and limit the use of the media by the recipient, for example, subject to payment. Furthermore the present invention can synchronize the rendition of the media at multiple locations for multiple users such that each user experiences the media at the same time regardless of the location.



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METHOD AND SYSTEM FOR TRANSMITTING MEDIA INFORMATION THROUGH A NETWORK

This application claims priority pursuant to 35 U.S.C. §119 from Provisional Patent Application Serial No. 60/116,555 filed January 21, 1999, the entire disclosure of which is hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to transmitting media through a network, and in particular transmitting information specifying particular media or portions of media in order to govern and synchronize the rendition of such media.

BACKGROUND OF THE INVENTION

Internet technology affords users across the globe the ability to communicate, e.g., by electronic mail. The sender types or otherwise inputs a message into their personal computer and directs the message to a recipient. An application on the sender's computer establishes communication with a server connected to the Internet and transmits the message. The message may be sent from one server to another depending on the recipient's address. Finally, the destination server transmits the message to the recipient's personal computer. The message may include any electronic data ranging from simple text to complex audio-video material. The entire process can be completed in a very short time.

With appropriate applications, such as ICQ and AOL's Instant Messaging and depending on network traffic and performance, the communication can be so fast as to seem instantaneous to the users participating in the communication. This is achieved by transmitting the message as it is being inputted

rather than waiting for the complete message to be input and then sending it. The basic requirement for this type of communication is that both of the users have activated access to the Internet (i.e. both users must be logged on to the network). In addition, the message is usually limited to textual data. To the users, the effect is real-time dialog using electronic data. This system is referred to as Instant Messaging.

An extension of direct communication between the sender and a specific recipient or group of named recipients is dynamic group communication. This system, referred to as Chat, is a conversation among several users where participants can join or leave the conversation at any time. Chat groups may be open to the public or restricted, e.g., limited to persons with a password.

There is a need for the application of advanced communication to multi-media data. What is further needed is a system that transmits data sequentially but also has synchronization capabilities so that users in different locations can experience the same media at the same time. The present invention satisfies these and other needs.

SUMMARY OF THE INVENTION

The present invention is a method and system for transmitting media information through a network in order to specify particular media or portions of media and to govern and synchronize the rendition of such media. Media objects stored on a server or other device connected to the network are accessible by specifying a content reference using an application appropriate for the network. For example, a standard browser is appropriate for accessing media stored on an Internet server where the content reference is a uniform resource locator. To send a media object from one user to another, the sender need only send the content reference. Conventional methods simply send only the location of the content. In the present invention, the content reference along with supplementary information is packaged in a data structure called a Handle to facilitate rendition of the media. A Handle may be sent to another user by E-mail, Chat, Instant Messaging, Cell Phone protocols or TV/Video links. When the recipient is ready to render the media object referenced by

the Handle, the recipient accesses the Handle and activates the appropriate software application such as a media or multi-media player. The software application provides an interface for the user to play the content. The Handle contains all the information needed to download content, and if applicable complete any commercial transactions pertaining to the use of the content. Specifically, the Handle includes information identifying each participant in the value chain, i.e., any entity that participated in the creation, resolution or transmission of the content that might receive some compensation for their participation.

Typically, the player acquires the media object referenced by the Handle by downloading it from the network. Then the player facilitates the rendition of the content, producing the audio and displaying the graphics or video, etc. The rendition may be subject to commercial limitations such as purchase of rights to use the content, in which case, the player or another application may facilitate the commercial transaction.

The player may also synchronize the rendition of the content at each of the users' locations. Using the supplemental information contained in the Handle, the rendering application, e.g. player, can coordinate playing the same content at the same time and rate at multiple locations.

The present invention is also applicable where the media is stored locally, for example, on disk or DVD, or on the user's personal computer, e.g., having been previously downloaded from the Internet.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of an arrangement of a Handle data structure for implementing the present invention;

Fig. 2 is a flow chart showing a method for using the Handle in accordance with the preferred embodiment of the present invention; and

Fig. 3 is a flow chart showing an alternative method for using the Handle in accordance with an alternative embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

In the preferred embodiment of the present invention, e-mail and chat communication systems utilize Handles to provide linkages to content and synchronization of that content. Synchronization refers to playing the same content at multiple locations simultaneously such that each of the users is experiencing the same portion of content at the same time. The content referred to may be any multi-media data including, for example, text, graphics, music and music videos. The invention has application to all media, with musical content being a preferred embodiment and not limiting of the scope of the present invention.

By way of overview and introduction, musical content, like other electronic data, may be distributed and transmitted over a network, such as the Internet. Musical content tends to require large amounts of data and the more complex the content, such as video material, the more voluminous the data. Because of the volume, it is not efficient to transmit the content in its entirety for every instance of reference. Instead of transmitting the content, only a reference to the content is transmitted. When the user receives the reference, the user can access the content directly. The content reference is referred to as a Handle and is discussed in detail below.

To support the electronic distribution of musical content and other media over the Internet, for example, software applications may be implemented at the user's personal computer. A media player is one such application and provides an interface for the user to play the music. Musical content commercially distributed over the Internet may be placed in a secure format to prevent unauthorized use. For such secured content, the player effectively decrypts or otherwise processes the content in preparation for playing. For example, the music may be encrypted in such a way as to prevent playing unless a payment is made to the retailer or content owner for the use of the music. The player can assist the user in paying for the use of the music and then playing the music accordingly, for example, by interfacing with a

payment clearinghouse and executing a payment transaction, as is well known in the art. The terms "play" or "render" with reference to the content include anything that can be done to or with the content, such as producing audio, displaying visual content, printing, and copying, etc.

The player may be used with content received over the Internet as well as locally stored content, i.e., stored on local or portable memory including diskettes, hard disks, optical disks, flash cards etc. The term disk is used throughout the description to refer to any such local or portable memory and is not intended to limit the scope of the invention. For content on disks, the player coordinates with the appropriate device such as a CD player or CD drive when rendering the content.

When the user engaging in e-mail or chat communications wishes to transmit content to another user, the user need not actually transmit the content itself but may instead send a reference to the content, namely a Handle, so that the recipient may access the same content.

Referring to Fig. 1, a Handle 100 is a small relatively secure data structure identifying particular content, and may contain various additional information about the content referenced. Content such as text, audio, graphics, video, etc, is stored in data structures called Content Objects and an Object ID 110 may be included in the Handle as a reference uniquely identifying particular content. The Object ID is essential for the effective implementation of a Handle. However, where a group of content objects are associated, a single Handle may contain more than one Object ID each referencing one content object.

Conceptually, each content object refers to an object in a product such as an album, single track, or EP (extended play). To identify the particular product containing the object, a numbering system such as the stock keeping unit (SKU) may be used. In such a case, the Handle would then include a SKU ID 112.

As applied in the commercial environment where content is sold and distributed, the Handle identifies the content and all the participants of the value chain associated with the content. Together, the Object ID and SKU ID identify precisely

what the content is. Other identifiers may also be included in the Handle to identify each of the value chain participants. Participants include, for example, the artist, the retailer, the network provider, the consumer, the software player vendor, the device manufacturer or licensor, the patent holder, etc. The Distributor ID 114 identifies the owner of or the agent of the owner of the Content Object(s) referenced. The Retailer ID 116 identifies a Retailer associated with the content referenced in the Handle. This may be the Retailer from whom the content was purchased, or any Retailer that the Distributor (content owner) wishes to reference. For video, the Channel ID (not shown) of a network may be more appropriate than a Retail ID. The Channel ID may be, for example, HBO or ABC. The Renderer ID (not shown) refers to the software that created the Handle, such as the Real Jukebox, which may participate in the value chain (e.g. 50 basis points for transactions that resulted from a purchase that resulted from a Handle it created). The Carrier ID (not shown) may refer to anyone who is actually responsible for carrying the content. For example, the Carrier ID may be AT&T if it was delivered over a telephone network or it could be the SD Memory Association, to effect payment to the patent pool allowing the memory format which supports superdistribution.

These identifiers are useful when performing a commercial transaction related to the content, such as a purchase. An application that dynamically computes offers for the sale or rental of content may use the value chain information in conjunction with a database of commercial information to generate the offers. One such application may be a reference service which maintains a database of commercial information from various participants of the value chain regarding the content. For example, a retailer may have contracted with a distributor for a 2% cut of the price provided the price is at least 7% above manufacturer cost and the retailer may have a mark up of 10% above cost. When a user wants to purchase particular content, the reference service can use the information in the Handle, such as the Retailer ID, to determine a valid offer based on the commercial information available from (or regarding) that retailer and provide the user with such an offer. The terms of an offer

may be included in the Handle as well. For example, the user may be presented with an offer to play the video for $2 per use anytime for a period of one year. Price, expiration date, and to whom payment is to be made are examples of terms that may be included in the Handle.

The concept of a Handle is flexible and can refer to content stored locally or remotely. If the content is stored remotely, it is accessible through connection to a network such as the Internet. Where the content is accessible through the Internet, the Object ID may be a Uniform Resource Locator (URL). Content stored locally includes any kind of medium such as CD, DVD, Flash memory, and hard drive. For locally stored content, a Disk ID 118 may be included in the Handle.

Typically, Handles are processor generated (e.g. by a computer or consumer device) when they are sent, but they can be stored locally or on a server and retrieved as needed. When a user retrieves a Handle and wishes to send it to another user, a User ID 120 may be included in the Handle to identify the user who is now sending the Handle.

To facilitate synchronization (described in more detail below), the Handle may contain the time when the Handle is sent and information about the rendition of the content at the sender's location. For example, the Handle may include a Local Time ID 122 and an Absolute Time ID 124. The Local Time ID is the local time as known by the device rendering the content. The Absolute Time ID is the absolute time as known by the network, e.g. GMT. The Handle may also include a location marker to indicate a particular point or place in the content. For example, if the content is a video, the marker may be set to a particular scene, so that the scene may be referenced directly. Such information is contained in a Temporal Location ID 126 which refers to a position, in the temporal domain, of the object referenced. For example, a Temporal Location ID may be expressed in units of time, e.g., 1 minute: 23 seconds, or alternatively units of frames, e.g., 18 frames. In addition to marking a place in the content it is useful to note the state of the content, such as play or pause.

The state of the content may be included in the Handle in the form of Temporal State ID 128.

Handles may be specialized for specific environments or applications. For example, Handles may be customized to create Network Handles which facilitate the electronic distribution of media over a network environment and the rendition of that media. A Disk Handle may be created to facilitate rendition of media stored locally. In addition, Handles may be customized to create Synch Handles which facilitate the synchronization of the rendition of the media in multiple locations. Each of these three examples is discussed below.

Network Handles usually contain the basic information needed to refer to, acquire and consume Content Objects that have been electronically distributed over a network. A Network Handle would typically include the SKU ID, Distributor ID, Retailer or Channel ID, Renderer ID, User ID and some number of Object IDs.

A user can attach a Network Handle in any number of ways, such as menu access, drag and drop, etc. Referring to Fig. 2, in a typical player environment the sequence is as follows: At step 210, the user clicks on a song title or other display element, which refers to a Content Object. At step 212, the user drags the selection into an e-mail message. At step 214, the player software binds together all the identifiers into the Network Handle. The identifiers include the Object ID(s), SKU ID, the User ID and identifiers for each of the participants of the value chain, e.g., Distributor ID, Retailer ID and Renderer ID. At step 216, the Handle is placed into the e-mail message. At step 218, the e-mail is sent to the recipient. At step 220, the recipient reads the e-mail and opens or accesses the Handle. At step 222, the e-mail application communicates with the operating system to call the application, which the user has designated to resolve Handles, usually, a media player application. The player may assist the user in acquiring and rendering the content. At step 224, the media player determines whether the content is resident locally. Typically, the content may be resident locally if the user previously acquired the content and stored it locally. If the content is not resident, at step 226, the player uses the Handle to

remotely access and download the content stored on some network server. Then at step 228, the media player serves as a user interface to facilitate the rendition of the content. The player uses the Handle (possibly in conjunction with other information such as commercial terms set by a retailer for that content) to determine the range of uses for which the user is authorized and/or has paid.

Disk Handles work in a similar fashion as Network Handles. The typical sequence is as follows: User clicks on a song title or other display element which refers to content on the disk. User drags the selection into an e-mail message. The player software binds together the Object ID(s), SKU ID, User ID, and Disk ID for the content (e.g., song). The player also binds the Retailer Id and identifiers for other value chain participants. The Disk Handle is placed into the e-mail message and the e-mail is sent to the recipient. The recipient then reads the e-mail and opens or accesses the Handle, which results in the e-mail application communicating with the operating system to call the application, which the user has designated to resolve Handles, usually, a player application. The player renders the content (if it has the right to) and if the disk is available (inserted, attached, on network). If the content is not available, the user is given the choice of either inserting the disk (or connecting to the network) or going to a retail web site (on the Internet or other network) to purchase the disk or its electronic equivalent.

Synchronization Handle (Synch Handle) is a specialized Handle that can be used in networked environments to synchronize two or more Content Objects that have temporal characteristics. To create a Synch Handle, the player application typically binds together the Temporal Location ID, Temporal State ID, the Local Time ID, the Absolute Time ID and the Object ID into a Handle that can be attached to or inserted in an electronic communication (e.g. chat window). The Synch Handle may be either a Network Handle or a Disk Handle with temporal information (the Temporal Location ID, the Temporal State ID, the Local Time ID, and the Absolute Time ID). The temporal information is used to synchronize temporal rendition (e.g. playing audio or video) when engaging in a dynamic chat.

Referring to Fig. 3, a sample usage scenario of the Synch Handle for a disk is as follows: At step 310, the user clicks on a song title or other display element which refers to content on the disk. At step 312, the user drags this into an e-mail message. At step 314, the player software binds together Object ID(s), SKU ID, Disk ID, User ID and identifiers for the value chain participants, e.g. Distributor ID, and Retailer ID. Additionally, for synchronization it adds the Temporal Location ID, the Temporal State ID, the Local Time ID and Absolute Time ID to the Handle. At step 316, this Handle is placed into the e-mail message. At step 318, the message is sent to or seen by (as in chat environments) the recipient(s). At step 320, the recipient opens or accesses the Handle. At step 322, the e-mail application communicates with the operating system to call the application which the user has designated to resolve Handles, usually, a player application. At step 324, the player renders the content (if it has the right to), and if it is accessible (usually stored locally).

The player resolves the objects temporally in the following manner: At step 326, the player subtracts the Absolute Time ID in the Handle (when the Handle was created) from the current absolute time to find the amount of time lapsed between the instantiation of the Handle and its resolution. The result is the Transport Time. At step 328, the player takes the Temporal Location ID (where in the object (song) the sender was when they sent it) and adds the Transport Time to determine where in the object (song) the sender is now. At step 324, the player renders the object beginning at that time according to the Temporal State ID (e.g. play).

For example, assume that the sender and recipient each have the content resident locally and that it takes eight seconds from sending the e-mail until the recipient receives it. The sender begins to play the content and then decides to e-mail the recipient to synchronize playing the content. By the time the recipient receives the e-mail, the sender has experienced eight seconds of the content. Hence the recipient's player will start playing the content an additional eight seconds into the content to that it is perfectly synchronized with the sender's experience of the content with respect to an absolute time.

An Affinity Group or Chat session refers to various communications between users through the same network including one-to-one communication, one-to-many communication, moderated or un-moderated group communication, Instant Messages, etc. In the context of Chat there can be multiple membership affinities based upon user defined preferences. Users can be members of multiple Affinity Groups and each of these Groups can be controlled independently and simultaneously in terms of privacy and availability parameters. Examples of some group definition are as follows: the Engineering Group available for Chat between 9:00 AM and 5:00 PM, Monday through Friday; a group of close family members available for Chat at all times; an Online Gaming Group available for Chat whenever the user is playing a game on line (a user's preferences allow the user to filter the group for a specific game or any game the user is playing); a No Doubt fan club available for Chat whenever the user is listening to No Doubt; a Foreign Film Group available for Chat whenever the user is on a film site registered by the user or the film site.

Dynamic Chat includes the ability to make the user available to an Affinity Group based upon user activity or external events. For example, a user plays a piece of music through a device (PC, DVD Audio Player, Interactive TV, Handheld Device, etc.) with an online connection (telephone, cable, cellular, satellite, etc). Once the music begins to play (either by inserting a disk into a drive or playing a stored file), the user is made available to a Dynamic Affinity (Chat) Group based upon the music they are listening to. A screen prompt (depending upon user preference) may be displayed asking the user if they would like to chat with others currently listening to the same or similar music. Participation in the Affinity Groupings may be overlapping because users may participate in multiple groups. The user can determine the basis or metric defining the group. For example the user may choose to chat with people listening to the same track, album, artist, or genre. If the members of the chat are interested in synchronizing the music they are listening to, a Synch Handle can be dragged from the player (see above) into the Chat Window. When the recipient sees

(receives) the Synch Handle, the recipient can activate (double-click) it and their music will be synchronized. If the recipient does not have the content or if it is on a disk not currently inserted, they are prompted to insert the disk or acquire the music.

User availability can also be influenced (dependent upon subscriber preferences) by subscription or usage information. The user can look, for example, for others watching a television program or a particular movie, others interested in recipes or a particular sport, or others in a certain situation or geographic location. The categories, Televison, Movies, Recipes, Sports, etc, serve as metrics to assist in forming Affinity Groups.

Web sites and Chat windows can interact in a number of ways. While browsing a web site, a user can become available to anyone else browsing that site or anyone browsing that site who shares any of the user's selection of metrics.

Technical information or support for various purposes may be facilitated by the use of Handles. For example, if the user requires technical assistance regarding a product or feature, a reference or pointer to the source for such technical information or support may be included in the Handle. When such technical information is needed, the reference in the Handle may be used to access and download the information. Alternatively, all or part of the technical support information may be included directly in the Handle. A user may access technical support on one occasion and keep the information for future reference by storing it locally. Once information is stored locally, it may be updated by using the reference in the Handle to locate and download the updated information.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

WHAT IS CLAIMED IS:

1. A method for transmitting media information over a network comprising the steps of:

generating a handle at a first location where the handle identifies a media object;

transmitting the handle from the first location to a second location through the network; and

rendering the identified media object at the second location in accordance with the handle.

2. The method as in claim 1 wherein the generating step comprises the steps of:

obtaining an identifier for the media object;

obtaining an identifier for each participant of a value-chain for the media object; and

combining the identifiers to form the handle.

3. The method as in claim 1 wherein the transmitting step operates to transmit at least one of: e-mail, chat, instant messaging, cell phone protocols, TV/video links, and dynamic chat

4. The method as in claim 1 further comprising the steps of:

transmitting the handle from the second location to a server;

at the second location, receiving from the server the media object identified by the handle;

optionally, displaying the media object at the second location when the media object contains a visual portion; and

optionally, producing audio corresponding to the media object at the second location when the media object contains an audio portion.

5. The method as in claim 1 wherein the media object identified by the handle is available locally at the second location, further comprising the steps of:

optionally, displaying the media object at the second location when the media object contains a visual portion; and

optionally, producing audio corresponding to the media object at the second location when the media object contains an audio portion.

6. The method as in claim 1, wherein the handle includes at least one of the following identifiers:

an object-id specifying a location of the media object;

a sku-id identifying a product number for the media object;

a distributor-id identifying a distributor associated with the media object;

a retailer-id identifying a retailer associated with the media object;

a channel-id identifying a channel associated with the media object;

a renderer-id identifying a software associated with the media object;

a carrier-id identifying a carrier associated with the media object;

a disk-id identifying a disk containing the media object;

a user-id identifying a user associated with the media object;

an absolute-time-id specifying the absolute time when the handle is transmitted;

a temporal-location-id specifying the amount of the media object rendered when the handle is transmitted; and

a temporal-state-id specifying the state of the media object when the handle is transmitted.

7. The method as in claim 6 wherein the handle additionally includes a set of terms that govern the rendition of the media object.

8. The method as in claim 6 wherein the handle additionally includes a reference to a set of terms that governs the rendition of the media object.

9. A method for transmitting media information among a plurality of locations over a network comprising the steps of:

rendering a media object at a first location;

generating a handle at the first location where the handle identifies the media object and identifies at least one value-chain participant;

transmitting the handle to at least one second location over the network; and

rendering the media object at the second location using the handle.

10. The method as in claim 9 wherein the step of rendering the media object at the second location comprises the steps of:

obtaining permission to render the media object at the second location from the at least one value-chain participant;

rendering the media object at the second location in accordance with such permission.

11. The method as in claim 9 wherein the step of rendering the media object at the second location comprises the steps of:

transmitting the handle from the second location to a server;

at the second location, receiving from the server the media object identified by the handle;

optionally, displaying the media object at the second location when the media object contains a visual portion; and

optionally, producing audio corresponding to the media object at the second location when the media object contains an audio portion.

12. The method as in claim 9, wherein the handle includes at least one of the following identifiers:

an object-id specifying a location of the media object;

a sku-id identifying a product number for the media object;

a distributor-id identifying a distributor associated with the media object;

a retailer-id identifying a retailer associated with the media object;

a channel-id identifying a channel associated with the media object;

a renderer-id identifying a software associated with the media object;

a carrier-id identifying a carrier associated with the media object;

a disk-id identifying a disk containing the media object;

a user-id identifying a user associated with the media object;

an absolute-time-id specifying the absolute time when the handle is transmitted;

a temporal-location-id specifying the amount of the media object rendered when the handle is transmitted; and

a temporal-state-id specifying the state of the media object when the handle is transmitted.

13. A method for transmitting media information among a plurality of locations over a network comprising the steps of:

rendering a media object at a first location;

generating a handle at the first location where the handle identifies the media object;

transmitting the handle to at least one second location over the network; and

rendering the media object at the second location such that the rendition of the media object at the second location is synchronized with the rendition of the media object at the first location.

14. The method as in claim 13 wherein the step of rendering the media object at the second location comprises the steps of:

transmitting the handle from the second location to a server;

at the second location, receiving from the server the media object identified by the handle;

optionally, displaying the media object at the second location when the media object contains a visual portion; and

optionally, producing audio corresponding to the media object at the second location when the media object contains an audio portion.

15. The method as in claim 13, wherein the handle includes at least one of the following identifiers:

an object-id specifying a location of the media object;

a sku-id identifying a product number for the media object;

a distributor-id identifying a distributor associated with the media object;

a retailer-id identifying a retailer associated with the media object;

a channel-id identifying a channel associated with the media object;

a renderer-id identifying a software associated with the media object;

a carrier-id identifying a carrier associated with the media object;

a disk-id identifying a disk containing the media object;

a user-id identifying a user associated with the media object;

an absolute-time-id specifying the absolute time when the handle is transmitted;

a temporal-location-id specifying the amount of the media object rendered when the handle is transmitted; and

a temporal-state-id specifying the state of the media object when the handle is transmitted.

16. The method as in claim 12 further comprising the steps of:

computing a transport time as the difference between a current absolute time and an absolute time when the handle was transmitted; and

at the second location, rendering the media object at a position within the media object corresponding to a temporal location incremented by the transport time.

17. A method for transmitting media information over a network comprising the steps of:

generating a handle at a first location where the handle includes an identifier for a media object and a reference to a technical-support source;

transmitting the handle from the first location to a second location through the network;

optionally, displaying the media object at the second location when the media object contains a visual portion;

optionally, producing audio corresponding to the media object at the second location when the media object contains an audio portion; and

establishing access to the technical-support-source according to the reference in the handle.

18. The method as in claim 17, further comprising the step of:

updating the technical-support-information previously downloaded from the technical-support-source.

19. A method for transmitting media information over a network comprising the steps of:

generating a handle at a first location where the handle includes an identifier for a media object and a reference to a technical-support source;

transmitting the handle from the first location to a second location through the network;

transmitting the handle from the second location to a server through the network;

at the second location, receiving from the server the media object identified by the handle;

optionally, displaying the media object at the second location when the media object contains a visual portion;

optionally, producing audio corresponding to the media object at the second location when the media object contains an audio portion;

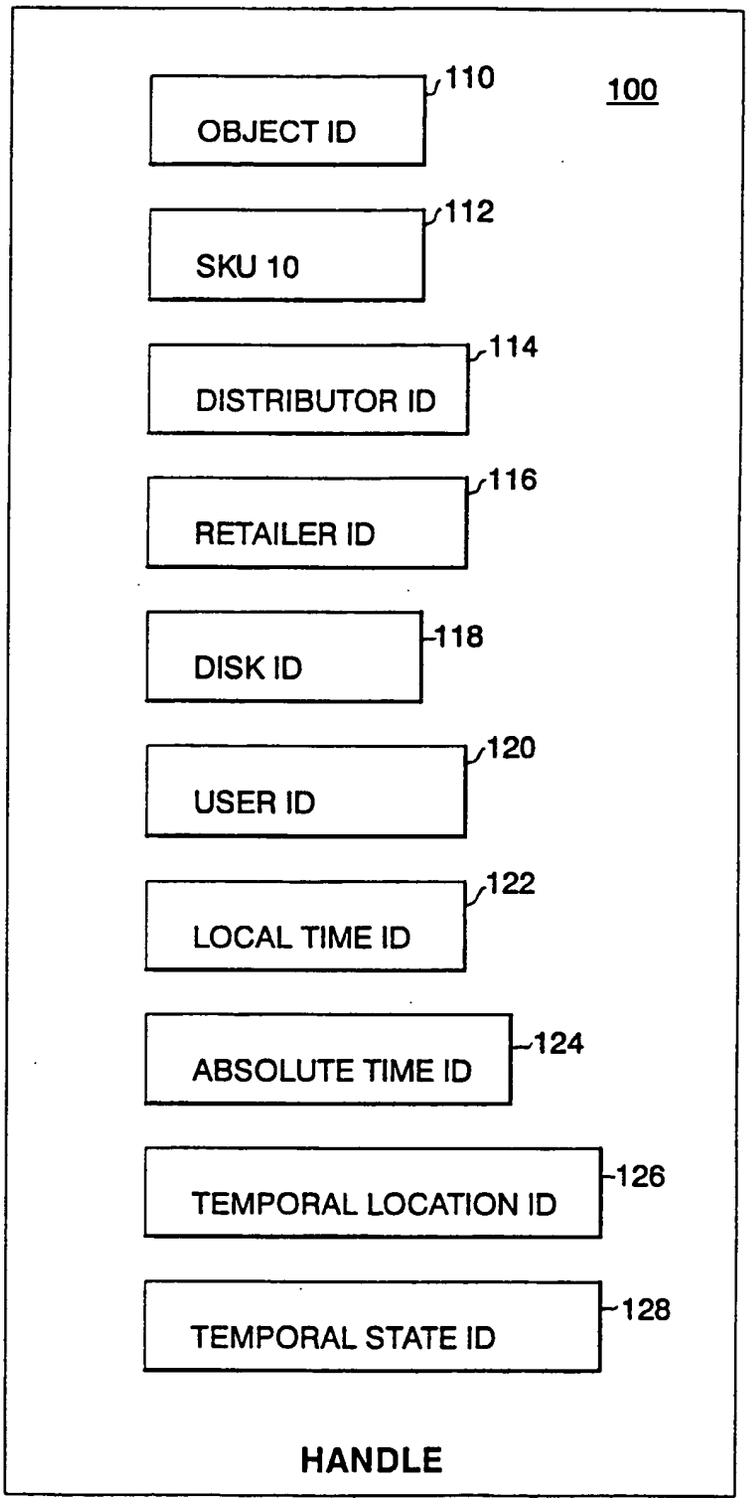
establishing access to the technical-support-source according to the reference in the handle; and

optionally, downloading technical-support-information from the technical-support-source to the second location.

20. The method as in claim 19, further comprising the step of:

updating the technical-support-information previously downloaded from the technical-support-source.

Fig. 1


100
OBJECT ID
110
SKU 10
112
DISTRIBUTOR ID
114
RETAILER ID
116
DISK ID
118
USER ID
120
LOCAL TIME ID
122
ABSOLUTE TIME ID
124
TEMPORAL LOCATION ID
126
TEMPORAL STATE ID
128
HANDLE

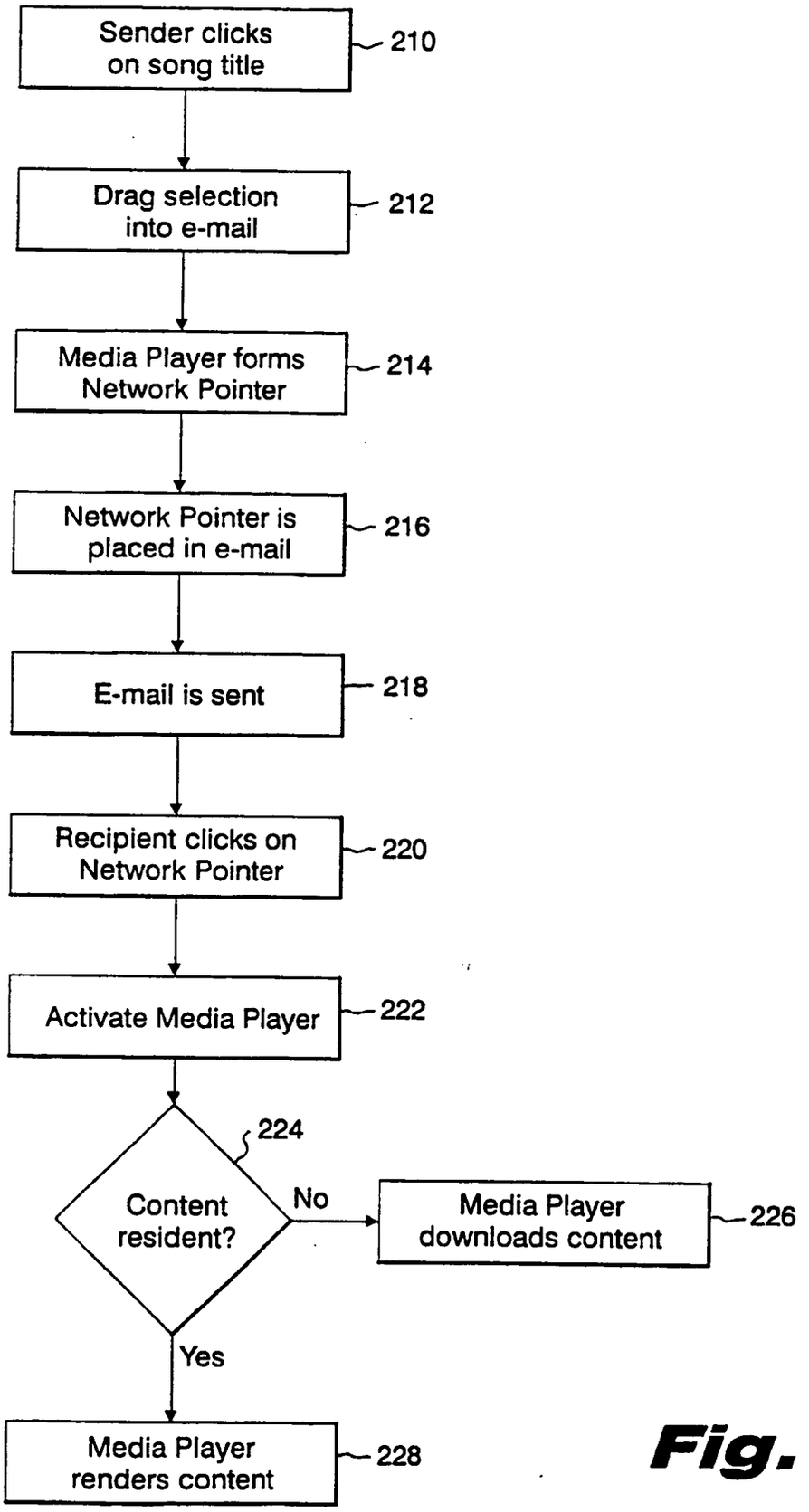

Sender clicks on song title
210
Drag selection into e-mail
212
Media Player forms Network Pointer
214
Network Pointer is placed in e-mail
216
E-mail is sent
218
Recipient clicks on Network Pointer
220
Activate Media Player
222
224
Content resident?
No
Media Player downloads content
226
Yes
Media Player renders content
228

Fig. 2

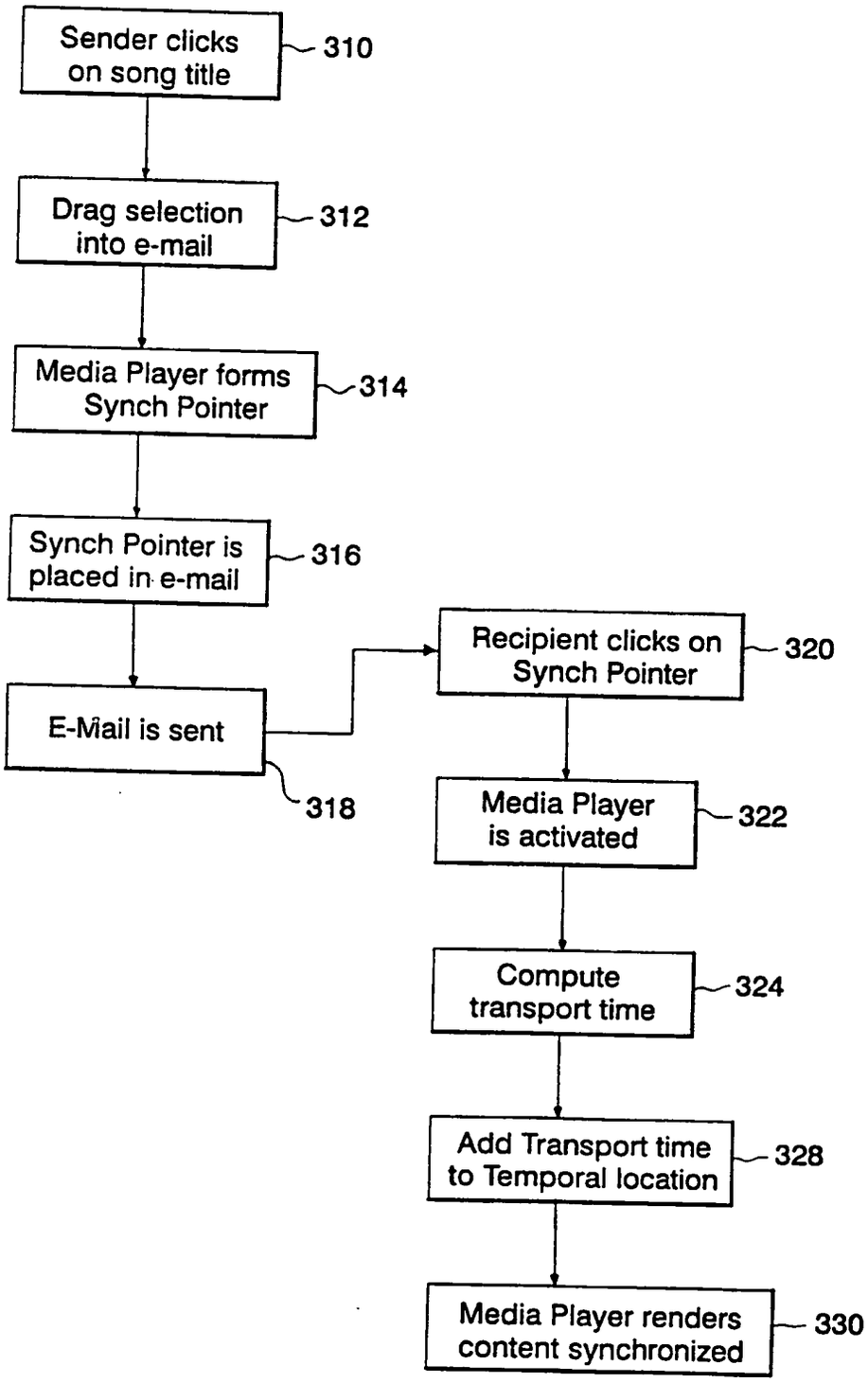

Sender clicks on song title
310
Drag selection into e-mail
312
Media Player forms Synch Pointer
314
Synch Pointer is placed in e-mail
316
E-Mail is sent
318
Recipient clicks on Synch Pointer
320
Media Player is activated
322
Compute transport time
324
Add Transport time to Temporal location
328
Media Player renders content synchronized
330

Fig. 3

INTERNATIONAL SEARCH REPORT

Inter. ..ol. . application No.
PCT/US00/02043

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) :G06F 13/00
US CL : 709/201, 218, 219; 704/201; 370/259
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. : 709/200, 201, 202, 203, 217, 218, 219; 704/200, 201, 270, 272; 370/259, 270, 546

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 practicable, 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,P	US 6,012,086 A (LOWELL) 04 January 2000, col. 1, line 59 - col. 2, line 20.	1-5, 9-11, 13-14, 1 & 7-20
X,P	US 6,011,761 A (INOUE) 01 January 2000, col. 2, lines 5-52.	1-5, 9-11, 13-14, & 17-20.
A	US 5,793,980 A (GLASER et al) 11 August 1998, see abstract.	1-20.

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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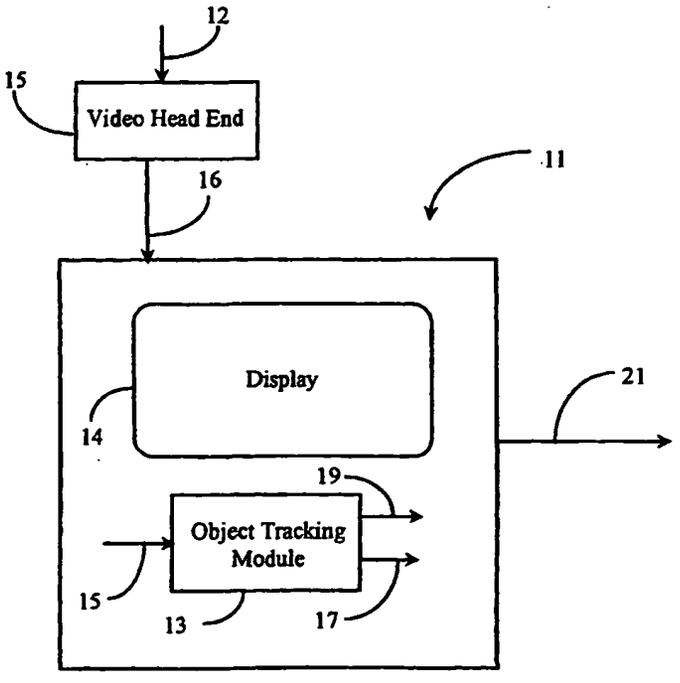
(54) Title: METHOD AND APPARATUS FOR MULTIPLEXING SEPARATELY-AUTHORED METADATA FOR INSERTION INTO A VIDEO DATA STREAM

(57) Abstract

An authoring system for interactive video has two or more authoring stations (11) for providing authored metadata to be related to a main video data stream and a multiplexor for relating authored metadata from the authoring sources to the main video data stream. The authoring stations (11) annotate created metadata with presentation time stamps (PTS) from the main video stream, and the multiplexor relates the metadata to the main video stream by the PTS signatures. In analog streams PTS may be created and integrated. In some embodiments there may be multiple and cascaded systems, and some sources may be stored sources. Various methods are disclosed for monitoring and compensating time differences among sources to ensure time coordination in end product. In different embodiments transport of metadata to an end user station is provided by Internet streaming, VBI insertion or by Internet downloading. User equipment is enhanced with hardware and software to coordinate and present authored material with the main data stream.



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Method and Apparatus for Multiplexing Separately-Authored Metadata for Insertion into a Video Data Stream

Field of the Invention

The present invention is in the field of video broadcasting, and pertains more particularly to methods and apparatus for multiplexing separately-authored metadata for coordination with a main video data stream.

Cross-Reference to Related Documents

The present invention is a continuation-in-part (CIP) of copending patent application 09/225,250, filed 01/04/1999 which is a CIP of 09/218,738, filed 12/22/1998, which is a CIP of 09/168,315, filed 10/07/98, which is a CIP of copending application 09/160,365, filed 09/24/98 which is a CIP of 09/154,532, filed 09/16/1998

Background of the Invention

With continuing development of new and better ways of delivering television and other video presentations to end users, and parallel development of computerized information systems, such as the Internet and the associated World Wide Web (WWW), there have been concerted efforts to integrate various systems to provide enhanced information delivery and entertainment systems. For example, developers are introducing integrated systems combining TVs with computer subsystems, so a TV may be used as a WEB browser, or a PC may be used for enhanced TV viewing.

In some systems computer elements, such as a CPU, memory, and the like, are built into the familiar chassis of a TV set. In such a system, the TV screen becomes the display monitor in the computer mode. In such a system, conventional TV elements and circuitry are incorporated along with the computer elements, and capability is provided for a user to switch modes, or to view recorded or broadcast video with added computer interaction. One may thus, with a properly equipped system, select to view analog TV programs, digital TV programs, conventional cable TV, satellite TV, pay TV from various sources, and browse the WWW as well, displaying WEB pages and interacting with on-screen fields and relational systems for jumping to related information, databases, and other WEB pages. The capabilities are often integrated into a single display, that is, one may view a broadcast presentation and also have a window on the display for WEB interaction.

In some other systems, computer elements are provided in an enclosure separate from the TV, often referred to in the art as a set-top box. Set-top box systems have an advantage for providers in that they may be connected to conventional television sets, so end users don't have to buy a new TV along with the computer elements.

In such integrated systems, whether in a single enclosure or as set-top box systems, user input is typically through a hand-held device quite similar to a familiar remote controller, usually having infra-red communication with the set-top box or a receiver in the integrated TV. For computer modes, such as WEB browsing, a cursor is displayed on the TV screen, and cursor manipulation is provided by buttons or other familiar pointer apparatus on the remote. Select buttons are also provided in the remote to perform the familiar function of such buttons on a pointer device, like a mouse or trackball more familiar to computer users.

Set-top boxes and computer-integrated TVs adapted as described above typically have inputs for such as a TV antenna (analog), cable TV (analog or digital), more recently direct-satellite TV (digital), and may also connect to video cassette recorders and to mass storage devices such as hard disk drives and CD-ROM drives to provide a capability for uploading video data from such devices and presenting the dynamic result as a display on the TV screen.

The present inventors have noted that with the coupling of computer technology with TV, many capabilities familiar to computer users have been made available to TV users. For example, ability to provide text annotation for TV presentations is considerably enhanced. Computer techniques such a Pix-on-Pix are now available, wherein separate TV presentations may be made in separate windows, or overlaid windows on the display screen. Separate windows may also support display from separate sources, such as an analog TV program in one window, a computer game in another, and a video conference in a third.

With the technologies described above becoming more available in the market place, it has become desirable to further integrate the technologies described so that a user viewing a video presentation might be enabled to gather additional information about a specific image entity or entities portrayed in a video through interactive method. An ultimate goal is to provide a means for advertisers to promote and sell products through user interaction in a way that minimizes steps required by such a user to access additional information regarding traditionally advertised products such as through commercials and the like.

In typical prior art video authoring systems, end users receive a single video stream that contains the video data and any added annotated data such as subtitling, sponsor logos, information blocks, and the like. However, it is desirable to build upon the goal stated in the preceding paragraph above, by having separate streams, one containing video data, and the other containing annotative data, that may arrive at and end user's location via different delivery media and be displayed synchronously on a suitable display screen.

An authoring system, known to the inventor, may provide image tracking coordinates along with various further annotation, and may deliver separate streams via separate carriers to an end user. Also known to the inventor is a system for providing a means of applying a signature and associative frame identification to the separate streams respectively before broadcast so that both streams may later be re-synchronized at the user's end. Such a system is likewise described under the cross-referencing section.

In current art commercial programming, various companies may purchase advertising blocks or time slots from a content provider. The content provider then edits-in such commercials to the appropriate slots before broadcasting. Typically, such commercial ads may be local to an area of broadcast and are limited in profiling to those general demographics associated with a range or geography of local viewers. For example, in a broadcast football game, commercials may be geared to appealing to a general profile of a sports fan. For a cable channel carrying exclusively women's programming, advertisements would be geared more toward women in general. The profiling or focusing of advertisement a company can do is thus quite limited.

A system known to the inventors and disclosed in this patent application under the sub-heading below titled "Personalized and Interactive Ad System/Network" provides in one embodiment an Internet-connected subscription server running an ad-engine in the form of a software application that has ability to select video ads according to user profile and to stream such ads to a user along with a main video data stream. In some cases the ads are interactive. In systems wherein the main video and such video ads are sent by a common carrier, such as an Internet connection, the ads are inserted in the main video stream in the form of video metadata.

It is desirable that that more than one authoring station or system may be used when creating metadata for delivery to an end user, because there are a variety of functions that may be implemented through metadata. For example, it is desirable that separate authoring stations will be used in hyper-video authoring, such as in providing object tracking coordinates, creating hot spots (hyperlinks) in a video, providing interactive regions for tracked objects, inserting URL's, providing review markers by scene authoring, and so on. Scene authoring based on scene-change-detection-technology (SCDT) has several purposes, such as providing thumbnails as bookmarks for users to select and review particular portions of video presentations, and for markers for ad insertion or insertion of other information. In addition, separate ad information may be authored by yet additional authors and provided as metadata for delivery to an end user.

While combination of live video and live annotation streams is treated herein concerning hyper-video authoring and delivery, it is generally understood that in the live case, annotation streams may be timed to run in sync alongside or over a main video steam. This process is performed at the provider's end. However, the presence of possibly two or more separately-authored annotation data-sets wherein the method of delivery is not necessarily in real time, requires a more comprehensive approach.

What is clearly needed is a method and apparatus for merging separately-authored sets of metadata such that the metadata is associated appropriately to a correct frame location in a main video. Such a method and apparatus would serve to ad flexibility to the authoring process and to simplify delivery methods.

Summary of the Invention

In a preferred embodiment of the present invention an authoring system for interactive video, comprising a video feed providing a main video presentation stream; two or more authoring stations coupled to the video feed providing authoring functions creating metadata for enhancing the main video stream; and a multiplexer for coordinating authored metadata with the main video stream. The authoring stations may note a presentation time stamp (PTS) of video frames or any other time stamp and incorporate it in the authored metadata for matching the metadata with the main video presentation stream.

In various embodiments there is a multiplexer for combining authored metadata with the main video data stream, and the multiplexer places the metadata in relation to the main video data stream according to the PTS. The multiplexer in some cases receives multiple video streams as well as the authored metadata, and time clocks are monitored for separate stream sources and clocks are adjusted to compensate for real-time differences in sources. One or more of the stream sources may be from a stored source. In some embodiments PTS values are rewritten in one or more streams to compensate for perceived time differences. Also in some embodiments PTS-enhanced

metadata is streamed over the Internet to an end user, and in others the PTS-enhanced metadata is inserted into video blanking intervals (VBI) of an analog stream according to the PTS. In still other embodiments the PTS-enhanced metadata is stored to be downloaded as needed by a user.

In various embodiments of the invention the authoring stations may include one or more of scene authoring, hyper-video authoring, and ad authoring stations.. At the user end the user system is enhanced with software for displaying the main video data stream and the authored metadata according to the PTS.

In another aspect of the invention a method for coordinating authored video metadata with a main video data stream is provided, comprising steps of (a) ensuring the main video data stream has a presentation time stamp (PTS); (b) feeding the digital main video data stream to authoring stations; (c) authoring matadata at the authoring stations; and (d) marking the metadata with presentation time stamps (PTS) from the main video data stream.

This method may further comprise a step for multiplexing authored metadata with the main video data stream, wherein the multiplexer places the metadata in relation to the main video data stream according to the PTS. There may also be multiple sources of video fed to the multiplexer as well as multiple metadata streams for a video, and a step as well for compensating for real-time differences between the multiple sources. In the compensating step, presentation time stamps (PTS) may be amended according to source time differences.

In some cases the PTS-enhanced metadata is streamed over the Internet to an end user. In other cases the PTS-enhanced metadata is inserted into video blanking intervals (VBI) of an analog stream according to the PTS. In still other cases the PTS-enhanced metadata is stored to be downloaded as needed by a user. The authoring stations may include one or more of scene authoring, hyper-video authoring, and ad authoring stations, and analog streams may be accommodated in some embodiments by conversion to a digital format before authoring and multiplexing, and in others by integrating a PTS with the analog stream. Also, at the final user's end, there is

software for rendering the main video data stream and authored metadata according to PTS .

In yet another aspect of the invention a digital video multiplexing system is provided comprising metadata inputs from video authoring stations; an input for a main digital video data stream; and an output to a video transport interface. The multiplexer notes presentation time stamps associated with authored metadata, and places the authored metadata relative to the main video data stream for transport to end users. The multiplexing system may have multiple video data stream inputs, and one or more of the inputs may be from a stored source. There may also be multiple video data stream inputs from multiple sources, and the multiplexer monitors real time clocks of the sources and uses the information to compensate one or both of the multiple streams. In case of real-time differences the multiplexer compensates incoming streams by buffering one or more of the streams. The multiplexer may also compensate incoming streams by amending the presentation time stamps of one or more of the streams.

In embodiments of the invention as taught in enabling detail below, for the first time it is possible to annotate one or more main video streams, either analog or digital streams, and to enhance the streams with authored metadata in a manner that multiple inputs may be made and fully coordinated to be completely useful when finally delivered to the end user, and many interactive functions not previously known in the art are provided.

Brief Description of the Drawing Figures

Fig. 1 is a block diagram illustrating an authoring system incorporating an image tracking module according to an embodiment of the present invention.

Fig. 2 is an illustration of a display screen depicting a tracked image entity according to an embodiment of the present invention.

Fig. 3 is an enlarged view of the image entity of Fig. 2 wherein key pixels are visible.

Fig. 4 is a exemplary view of a value table containing values of signature pixels according to an embodiment of the present invention.

Fig. 5 is a motion diagram illustrating an image tracking process according to an embodiment of the present invention.

Fig. 6 is a block diagram illustrating a data-stream generator and set-up function of the tracking module of Fig. 1 according to an embodiment of the present invention.

Fig. 7 is a block diagram illustrating a real-time video authoring and delivery system according to an embodiment of the present invention.

Fig. 8 is a block diagram illustrating multiple authoring station architecture according to an embodiment of the present invention.

Fig. 9 is a block diagram illustrating an exemplary modular architecture of a single authoring station according to an embodiment of the present invention.

Fig. 10 is a block diagram illustrating a signature application apparatus at the authoring end according to an embodiment of the present invention.

Fig. 11 is a process flow chart illustrating logical steps of providing a signature at the authoring end according to an embodiment of the present invention.

Fig. 12 is a block diagram illustrating a data capture and synchronization device at the user's end according to an embodiment of the present invention.

Fig. 13 is a Process flow chart illustrating logical steps for capturing and synchronizing separate video streams for user display and interaction according to an embodiment of the present invention.

Figs. 14 and 15 are illustrations of a graphic user interface of a video editor according to an embodiment of the present invention.

Fig. 16 is an overview of an exemplary ISP-based video delivery network supporting personalized and interactive video advertising according to an embodiment of the present invention.

Fig. 17 is a process flow chart illustrating video-ad server function and interaction according to an embodiment of the present invention.

Fig. 18 is a diagram of a multiplexing system according to an embodiment of the present invention.

Description of the Preferred Embodiments

According to a preferred embodiment of the present invention, a method and apparatus is provided which allows a programmer functioning in a video editing mode to initiate tracking of any image entity or entities in a video stream, after which initiation tracking may be automatic, wherein appropriate coordinate-tracking data associated with the image entity or entities is provided synchronized with the original data stream so that such entities may later be rendered identifiable and interaction-capable to an end user. By image entity is meant any person or thing depicted in a video display, such as a player in a sports game, and actor in a play, a car in a car race, and so on

Fig. 1 is a block diagram illustrating an authoring station 11 adapted for accepting a video data stream 16 from a video head end 15 as is known in the art. The original video data source 12 may be any recorded or live source and is not limited as to protocol. Authoring station 11 includes a display 14 and an object tracking module 13 which is adapted to automatically track image entities in a video presentation, and to synchronize the tracking result with the video data stream.

The overall purpose of the authoring station is addition of innovative material to the video data stream, such as text overlay, graphic icons and logos for advertisement, some of which may be associated with identity and address data to allow a viewer at a computerized end station to access advertisements and other data which may be associated with individual entities in the video presentation. Advertisements may, for example, be associated with a tracked object. Also the text

annotations could either be set to track along with an object, or appear in a fixed position anywhere on the screen, as they are typical in broadcasts today.

In Fig. 1 input data stream 15 to tracking module 13 is a stream of successive bitmapped frames in a normalized resolution , required by the tracking module. The authoring station can be based on virtually any sort of computer platform and operating system, and in a preferred embodiment, a PC station running MS Windows is used, in which case the input stream 16, regardless of protocol, is converted to bitmapped frames displayed typically at 30 frames per second with a resolution of 352 by 240 pixels.

The use and operation of the tracking module is disclosed below in enabling detail, and outputs both the original data stream 19 and an annotation stream, which in this case comprises the data of one or more tracks for moving entities in the video display. These two streams may be combined or separately provided to downstream processes and equipment, and other annotations and alterations may be made to the data stream in the authoring station, as described above. Output 21 from authoring station 11 is meant to be a general indication of data output, and not to indicate that there is a single data stream. There may be multiple streams of various protocol.

An authoring station such as station 11 comprises software that may process various media (analog or digital) including video presentations or streams, both live and recorded. For example, included video stream types including but not limited to common formats such as Audio Video Interleave (AVI) and Moving Pictures Experts Group (MPEG). Video source 12 may embody any video source that may be known in the art such as a CD-ROM, Satellite TV, cable TV, VCR, Internet Server, and so on. Video source 12 may provide prerecorded video or live broadcast video. Also, future new formats of video streams shall be considered equivalent in the sense of this invention.

As described briefly above, the inventor has found that a suitable computer platform for performing the tracking process enabled by tracking module 13 is a PC/VDU running Windows with a central processing unit (CPU) operating at at least 300 megahertz and having at least 64 megabytes of random access memory (RAM).

Video frequency or a frame speed of 30 frames per second (FPS) is utilized in this example as a suitable and compatible standard for processing. The display size of the video picture in this instance is 352 X 240 pixels, which is a reduced resolution from that normally displayed in a video presentation on most end use stations, but provides a suitable format for the present tracking process. It will, however, be apparent to the skilled artisan that the example parameters presented herein are not limiting to the success of practicing the present invention. Other video frame speeds, video display sizes, computer platform types and speeds, and software types may be employed in other embodiments of the present invention. The only requirement is that the processor be powerful enough to enable the tracking process at the necessary frame speed.

Tracking module 13 is a software module provided as a component of a Windows driver in this particular embodiment. In other embodiments, module 13 may be provided as a driver or as a component of a driver for another platform such as may be used as an alternative to Windows™. Module 13 interfaces with other software components executing on station 11 for the purpose of adding the functionality of the present invention which is the ability to track a moving image entity within a presented video stream.

Tracking module 13 is adapted to determine a pixel signature associated with a visual entity to be tracked in a video display, and then to determine the path of the pixel signature in the display as the path of the image entity to be tracked.

Once the video stream is in the domain of tracking module 13, an image entity in a fist bitmap image is selected to be tracked, and further frame-by-frame movement of the image entity is automatically tracked. Tracking data associated with a tracked image entity is associated with the bitmap video stream via a second synchronous data-stream comprising the frame-by-frame coordinates of the tracked image entity. This output video stream comprises the original stream plus the synchronous data stream that contains the tracking data and is illustrated (via directional arrow) as leaving module.

The end result of tracking process of the present invention is a series of coordinates of an assumed center point of a tracking object associated with the image entity selected to be tracked. Through additional editing processes a moving region associated with the image entity in a display may be made to be interactive and identifiable to an end user. User interaction with such an image entity during viewing of a video can be programmed to provide additional network-stored information about that entity to suitable customer premises equipment (CPE) adapted to receive and display the information. Such further information may be displayed, for example, as an overlay on the display of the dynamic video containing the subject image entity. In this way, advertisers, product promoters, or the like may present information to end users based on user interaction with an associated entity in a dynamic video display.

Fig. 2 is an illustration of a display screen depicting an image entity 27 to be tracked according to an embodiment of the present invention. PC/VDU display 14 shows a bitmap image stream during the tracking process. Screen 14 is a display screen as viewed by a programmer or editor performing the tracking process.

To begin, an editor selects, typically by well-known cursor technique, a tracking box 29 of pre-selected shape and size, and places (drag-and-drop, click-on etc.) the selected box over an image entity to be tracked, with the center point of the box substantially centered on the image entity to be tracked or at least on a portion of the entity. In a preferred embodiment the editor will have a varied repertoire of sizes and shapes of tracking boxes from which to select, which may be displayed in such as a menu bar, as is well-known in the art. In this example, the editor wishes to track a diver 27 from a diving board 30 and into the water below the diving board. The image entity selected for tracking, however, is not the diver per se, but the swim suit worn by the diver, for reasons which will become more clear in the descriptions below. It is logical to assume that tracking, in this embodiment, commenced as diver 27 begins his dive.

A semi-transparent shape 31 defines an area that may be rendered an interactive area linked to the swim suit of diver 27 as might be seen by an end user watching the video. Typically, shape 31 which is in this case the shape of a star, will not be present

or seen in screen 14 during the tracking process, but is illustrated here solely for the purpose of discussion, in that through later video editing processes such shapes may be added to an image stream based on the provided information (frame by frame tracking coordinates of the swim suit).

As previously described, as an initiating event, tracking box 29 is placed over an image entity to be tracked, in this case the swim suit and the tracking process is activated via a mouse click or other command action such as may be executed via keyboard input. Upon tracking box 29 being activated the tracking module creates a table or list comprising pixel values associated with a target number and spatial arrangement of pixels (not shown in Fig. 2) associated with tracking box 29. These target pixels are determined in a preferred embodiment by a random algorithm which is shaded to provide a higher density at and around the centerpoint of the tacking box. The color values for the target pixels are taken from the Video Graphics memory array of the authoring station being used to display the video stream. Specifically, the color (e.g. RGB) values of each target pixel are used as a base comparison signature for tracking box 29 during frame by frame motion (internal frame rate).

Activation of tracking box 29 invokes object tracking module 13 of Fig. 1 and it's subsequent functions. Further detail regarding the unique use of target pixels is described below.

Fig. 3 is an enlarged view of the image entity of Fig. 2 wherein key pixels are shown within the selected tracking box. Tracking box 29 may be any size or shape desired for fitting over an entity selected to be tracked, however a predefined number of target pixels, represented via elements 32a-n, remains substantially constant regardless of size and shape of the tracking box selected.. The reason, in this embodiment, for a relatively constant number of pixels is that the process requires an iterative calculation process wherein the values for each signature pixel are involved in calculation at least once for each succeeding frame of the video while the tracking process is running. Since the computing power of the tracking stations remains constant, it is desirable to use a relatively large number of signature pixels (more definitive signature) but not to exceed the computing power of the station.

Although the number of pixels shown in Fig. 3 as signature pixels for exemplary purposes is rather small, and the spacing is indicated as rather regular, there will in reality be a rather larger number of signature pixels associated with a tracking box. In development of working models of the tracking module the number of pixels usable with a high-end PC is from 300 to one thousand. This number, of course, may vary in various embodiments of the tracking module according to the present invention. It has also been determined that a default arrangement of signature pixels with a higher density toward the center of the tracking box is desirable. With the number of pixels constant, or relatively so, from one tracking box to another, the density will vary according to the areal extent of the tracking box selected.

In a preferred embodiment, as briefly mentioned above, the spatial arrangement of the target pixels is randomly generated with a higher density toward the center of the tracking box. The randomization may occur before or after a box is selected. In some cases, an editor may select a shape and resize the box before or in the process of placing the box over an entity to be tracked. In such cases the distribution of target pixels may change as the box is resized, and so on. In other embodiments default target pixel formats may be used, and these may be random or regular, depending on several factors.

In this example, tracking box 29 is of the shape of a rectangle having somewhat rounded corners. The center point of tracking box 29 is preferably placed near an apparent center or median point the entity to be tracked. Thus, signature pixels 32a-n are concentrated on the swim suit of the diver to be tracked.

When tracking box 29 is positioned and activated over an image entity to be tracked, in this case the diver's swim suit, a signature table is created and stored as described above. The spatial arrangement of the signature pixels is a known default pattern within the tracking box. Therefore, when the center of the tracking box in a frame is decided (box placed and initiation signaled) the coordinates of the signature pixels relative to the bit mapped frame are easily calculated. Each signature pixel then has a known value for R, G and B from the video memory array for the frame

displayed. This base signature is captured for tracking purposes. These values are entered into a base table as described further below.

Fig. 4 is an exemplary view of a base value table containing values of signature pixels according to an embodiment of the present invention. Value table 33 is created during the initial activation of an image tracking process as described above. Value table 33 contains 5 values per target pixel. A bracketed line A illustrates those 5 values as listed from top to bottom in the first vertical column under *Pixel*. They are, in order of presentation, X (coordinate), Y(coordinate), R value, G value, and B value. Cartesian coordinates have been assumed for exemplary purposes, but spherical coordinates, or any other coordinate system may also be used.

Each individual pixel is illustrated serially to the right in table 33 as shown by arrow B with the previously described pixel values presented in vertical columns below. For example, pixel 1 shows values X1, Y1, R1, G1, and B1 in a vertical column below. The next column to the right contains pixel 2 and associated values are identically presented. The numbering scheme, of course may any desirable and workable scheme, as the order of calculation is not fundamental to the invention. The representation of value table 33 as illustrated herein is meant only to be an example of a table for storing values. The values being collected and stored may be kept in any logical order such as in a data list or the like.

Once table 33 is created, in the presently described embodiment it remains the signature table for the specific entity being tracked. For example, using the swim suit, table 33 would reflect the x and y coordinates and the RGB values of the signature pixels within and around the suit at the moment the tracking box is activated.

After table 33 is created and stored, which occurs during the time of a single frame at 30 frames per second in this example, a second frame enters the pipeline of the tracking engine. The pipeline is typically 10 frames, but may be more or fewer frames in other embodiments. In the second frame, or the frame following the frame in which the tracking process is initiated and the signature table is created, it must be assumed that the image entity to be tracked has moved. Since there is no way at this

point to know the magnitude and direction (vector) of movement, an image testing process is performed to locate the best match for the image signature.

Typically, in a single frame, an entity, unless moving uncommonly rapidly, will not have moved far. A pattern of assumed center points in an expanding spiral around the original center point of the tracking box is therefore assumed and the test pixel pattern at each assumed center point is taken and compared to the stored base signature. The best match to the stored signature is taken to be the new position of the image entity to be tracked, and the center point for the tracking box is recorded. This spiral testing method is performed at each assumed new image position as is further described below.

Fig. 5 is a motion diagram illustrating an image tracking process according to an embodiment of the present invention. Screen 14 shows a first position L1 of the center point of tracking box 29. This introductory position is the beginning of the tracking process as previously described. L1 has the x and y coordinates of the center point of tracking box 29 at the instant it is placed over an image entity and activated. The image entity itself is not illustrated here for the purpose of simplifying explanation, however, it may be assumed to be present.

In the first iteration the center point tracking box 29 is moved from L1 to L2, shown by vector V1. This first vector is determined by the spiral test pattern as briefly described above, more fully described below. Once this first vector is determined, an assumption is made that a moving entity will typically continue moving in at least nearly the same direction, and at about the same velocity. Therefore, to determine a next assumed position, vector V1 is applied from L2 to determine projected position Lp. At the newly assumed position for the third frame, the spiral pattern test is performed again, and again the best signature match is taken as the correct position for the center point of tracking box 29. The assumed position for the third frame, Lp is now moved to P3, which is found to be the best signature match to the originally stored image signature. At P3 new vector V3 is determined, and V3 is used for the next frame projection.

The process is thus continued from frame to frame, using the last vector as a tool to provide an assumed next position, and then testing that position for accuracy.

In the spiral pattern test, with respect to position Lp, a pattern of 24 points (connected by line segments for illustrative purposes) are illustrated as forming an outward spiral in a counter-clockwise direction from point Lp. A signature comparison is performed at each of the 24 points in order proceeding from Lp, the results are stored, and the best match is found. It will be appreciated by the skilled artisan that the spiral pattern and the order of testing is convenient and not limiting for the invention, as other patterns and orders may well be used.

The unique testing and correcting mechanism in this embodiment is achieved through the use of an algorithm that computes the average root mean square difference of the RGB color values between the colors of the test pixels and the stored signature colors of the target pixels. That is, for each new assumed position, each default pixel position in the test pattern is taken from the video memory array along with R, G and B values. The exemplary root mean square method takes the square root of the sum of the squares of the delta, or deviations, of each pixel color magnitude at each position in the test pattern, sums over all of the pixel pattern, and divides by the number of pixels in the pattern. In this method the best match is determined by the lowest value for the calculation.

The algorithm executes each time a test is conducted for all of the involved test pixels or one time per frame interval, assuming that each iteration is successfully completed in the time of the single frame. If computing time is inadequate, a frame may be skipped. Factors affecting the number of text positions used in an iterative test pattern, such as the spiral position test, include frame speed CPU power, total Image screen-size, and so on.

It will be apparent to the skilled artisan that the least mean square method of comparison of color signatures is a convenience, and not a limitation to the invention. There are a variety of ways the color signatures at assumed image entity positions may be compared with the original image entity signature.

In the embodiment herein described all new and assumed positions for tracking box 29 are tested against the originally-stored image. In an alternative embodiment of the invention, at default intervals, the last best signature is assumed as a new base signature, based on the fact that an image entity, such as actor in a video, may move in a way that the image signature may change.

Fig. 6 is a block diagram illustrating a data-stream pipeline and set-up function of the tracking module of Fig. 1 according to an embodiment of the present invention. During the tracking process as described above, a separate data stream is created, synchronous to the original video stream, that contains the coordinate data for the center position of tracking box 29 determined in each frame. As previously described with reference to Fig. 1, this output (combining both streams) is directed back to be viewed.

Tracking module 13 takes in the original video stream illustrated herein via a directional arrow (element 35) into a module 37 responsible for set-up, process execution and data-stream generation. Module 37 is capable of working in a ten-frame pipeline with 16, 24, and 32 bit resolutions. It is important to note here that the parameters of a ten-frame pipeline and 16, 24, and 32 bit resolution capability are exemplary of a preferred embodiment judged by the inventors through empirical method to be adequate for most instances. In other embodiments, other resolutions and frame capacities may be employed.

Set-up includes operations such as pre-selecting tracking box shape and size, pre-selecting number of target and test pixels, and so on. Process execution encompasses initiating and carrying out the automated tracking process including iterative execution of the test algorithm. A data-stream generator produces a data-stream with tracking coordinates for each frame interval which is synchronous to the frame intervals of video stream 35. Although the inventor has chosen to illustrate only one module 37 responsible for three basic functions, it will be apparent to one with skill in the art that three separate modules may be provided with each responsible for one dedicated function.

Two synchronized streams, video stream 39, and data stream 41, are output from tracking module 13. With respect to viewing the tracking process on a display such as screen 14 of Fig. 2, for example, it is desired that there is no visible wavering or other erratic movement of a tracking box such as box 29 of Fig. 2 as this would translate to the end user having an interactive icon or transparent shape that wavers identically when watching the video. Therefore, an additional smoothing module may be provided and executed at a time interval before 10 data-frames leave module 13. This module would use known algorithms to judge and correct x and y coordinate positions to obtain a smoother curve or arc over a 10 frame interval in cases wherein image motion is not in a straight line. The requirement of such a module is not needed to practice the present invention, but rather preferred for further refinement of the end product.

In the interactive system described above a first vector was determined by the spiral testing method described. In another embodiment, the editor who selects and places the tracking box on an entity to be tracked may also move the tracking box (drag) along the apparent path of the moving entity, which in this alternative embodiment creates a series of new positions for the tracking box equal to the number of frames over which the editor drags the tracking box. When the editor drops the box, the tracking engine takes over, using the last vector as an assumption for a new position, as described above, and the tracking continues automatically.

It will be apparent to one with skill in the art that those who advertise and promote products or services may utilize the capability as taught by the present invention to create a venue for the promotion of such products or services. For example, a subscriber (end user) to a service specializing in providing video media wherein interactive advertisements are presented may obtained CPE equipment adapted to display, identify, and provide, through interactive device, methods for obtaining additional information regarding image entities. Such interaction may be a simple mouse click on the entity during playback of the video which may invoke a link to a network-based data-server that may deliver the data to the end user via modem connection or the like.

In another embodiment, the method and apparatus taught herein may be used for interactive teaching purposes wherein a highlighted image entity may be clicked on a special display screen causing related information to appear in a second window or screen associated with a plurality of connected devices such as PC/VDU's used by students participating in the session.

It will be apparent to one with skill in the art that through later video editing techniques, a tracked image may have other created images associated with it such as semi-transparent shapes defining interactive regions, information blocks that follow the image, and so on.

Multi-Image Tracking System Architecture

According to a preferred embodiment of the present invention a unique authoring system architecture is provided which allows multiple authors to track separate images and add annotations including interactive icons, animated graphics, text, audio etc., to a single live or pre-recorded video feed. This is made possible via an innovative synchronous architecture wherein such authoring may be performed in near real-time such that delay of the broadcast video to an end user is negligible.

Fig. 7 is a block diagram illustrating a real-time video authoring and delivery system according to an embodiment of the present invention. A video capture and delivery architecture 43 is provided and adapted to include the authoring system and architecture of the present invention. Some components of architecture 43 are known and currently practiced in the art. For example, architecture 43 comprises a video head end 45 which is the source of the video stream for the innovative architecture of the invention. Head end 45 may be from live video feed from a video camera at the scene of, for example, a live sporting event. In another embodiment, head end 45 may comprise a pre-recorded video feed that is re-broadcast to end users, however, for the purpose of the present invention, an example of a live video broadcast will be used extensively.

Also included in architecture 43 and known in the art is a broadcast system 47. Broadcast system 47 may be any type of system adapted to deliver live or pre-recorded video signals such as via cable TV, Internet delivery, satellite system, network broadcast, etc. Broadcast system 47 delivers the video feed to any number of end users such as are represented here via element numbers 48a-48n. End users 48a-n are shown logically connected to broadcast system 47 for associative purposes only with such logical connections representing typical avenues of media connection such as cable, satellite, and so on.

In a preferred embodiment of the present invention the live video stream from video head end 45 is diverted to a unique authoring system 51 from it's normal path to broadcast system 47, as illustrated via diversion path 49. Alternatively the video feed may just be tapped from its normal path to broadcast system and fed to the authoring system.

Authoring system 51 receives stream 49 for the purpose of authoring the stream as described above. Authoring system 51 comprises multiple dedicated authoring stations equipped with software capable of tracking images within the video stream and adding annotations including interactive icons, text, animated graphics and sounds , as is disclosed in enabling detail below. Due to a unique synchronous architecture which allows multiple image tracking and annotation operations to be performed simultaneously, the resulting output streams, shown here as stream 53 (video stream) and stream 55 (annotation stream) may ultimately reach end users such as users 48a-n via broadcast with minimal or no delay. However, instead of a diversion if the video stream is only tapped from the video head end 45 into the authoring system 51, the video stream 53 may not be used further and the video stream from the head end 45 is sent directly to the broadcast system 47. In some of the further discussion we may assume that the video is diverted and not just tapped from the video head end 45, but as mentioned above this may not always be the case.

With respect to output streams, the fact that there are two separate output streams (53 and 55) shown proceeding from authoring station 51 reflects just one embodiment in which the image tracking coordinates and annotations are contained in

one annotation data stream (55) that is separate from stream 53 (video stream). However, it may be desirable to combine the streams before being delivered to broadcast system 47 (after authoring). If the video stream and the annotation data stream are sent separately then they have to be synchronized at the user's equipment so the video presentation may be viewed with the annotated material. One good reason for not combining the two streams immediately on authoring is that annotation stream 55 is not limited to being delivered via broadcast system 47. For example, element numbers 55a and 55b represent annotation stream 55 in states of being delivered to end users 48a-n via alternate or variable routes, such as by an Internet connection.

Stream 55a, in this example, is illustrated as being sent along with stream 53 to broadcast system 47 where the streams are combined before broadcasting. In case of an analog broadcast the annotation data stream (stream 53) may, for example, be sent using the Vertical Blanking Interval (VBI) and synchronized with the video. In case of a digital broadcast (using for example MPEG2 digital video format) this annotation stream may be sent as a private data stream multiplexed with the audio and video streams in the digital broadcast. Annotation stream 55b is alternatively illustrated as being delivered over a wide-area-network (WAN) 57, which may be the Internet or other type of WAN, directly to one, some or all of end users 48a-n via a path 59 which represents collective individual user WAN connections. Likewise, still other known delivery mediums may be used. In some special instances, streams 53 and 55 may be combined before leaving authoring system 51. There are many variable possibilities.

It will be apparent to one with skill in the art that there may be more than one type of broadcast system used in the broadcast of a single video event as shown in this example without departing from the spirit and scope of the present invention. For example, some of users 48a-n may receive streams 53 and 55a via cable, while others may receive the streams via satellite and so on. Similarly, some of users 48a-n may receive data streams through separate media of transport such as stream 53 via cable and stream 55b via Internet and so on. Any combination is plausible provided that the user has appropriate equipment and connections adapted for receiving and displaying the broadcast video and synchronously display the annotation data comprising of

tracked entities, icons, text, sounds, animated graphics and the like. The scope of the present invention is not limited by the medium of transport used for transmitting the video and the annotation data stream.

Fig. 8 is a block diagram illustrating a multiple authoring station architecture for authoring system 51 according to an embodiment of the present invention. Authoring system 51 comprises a plurality of (in this case 4) authoring stations 61a-61d that are adapted for tracking image entities and providing additional annotation, including annotation regarding tracked entities. An authoring station such as station 61a is analogous to authoring station 11 of Fig. 1 except for added capability, according to embodiments of the present invention, for providing further annotation (other than tracking information) and interactive applications as previously described. More detail regarding such capability is provided below.

Video stream 49 from the video head end enters authoring system 51 and is simultaneously provided to each authoring station in the system, such as stations 61a-d (illustrated via branching arrows). It will be apparent to one with skill in the art that there may be more or fewer than four authoring stations used without departing from the spirit and scope of the present invention. For example, if only two entities are to be tracked, then only two stations may be required to be operational. If there are nine entities to be tracked, then nine stations may be required to be operational. Similarly, each authoring station may or may not be similarly equipped with respect to tracking and annotating. For example, if there are three entities to be tracked and some general annotation (not particularly associated with an image) to be performed, then stations 61a-c may be assigned to tracking and station 61d may be reserved for general annotation and so on.

After authoring is performed via stations 61a-d, as illustrated in this example, there are two streams that are output from each station. One is video stream 53 which in most embodiments will remain unchanged under most circumstances, except for any frame speed adjustments and normalization of video image such as was described with reference to Fig 1. above depending on the requirements of the video delivery system.. The other is an annotation data stream containing annotations such as are individual to

each station where annotations are performed. For example, annotation streams 62a-62d are associated with stations 61a-61d respectively. Annotation streams 62a-d differ from each other only in that the annotations contained therein are different as a case of being authored in different stations.

Annotation streams 62a-d are generated so as to be synchronous with stream 53. Therefore, it is ideal that all output streams are running in synchronous mode while leaving each authoring station. Previously described conventions such as the ability of image tracking software to skip frames helps to assure this ideal.

An authoring server 63 is provided and adapted to combine annotation streams 61a-d into one annotation stream 55 which is analogous to stream 55 of Fig. 7. In this way, all annotations performed separately may be combined and may act in unison at the users end. Video stream outputs from the separate stations converge, or more specifically, remerge into video stream 53 as illustrated via a horizontal, left-facing arrow labeled element number 53. Video stream 53 is the normalized video output from each authoring station and typically does not include any annotations.

If there is a known latency with respect to recombining streams 62a-62d in server 63, then video stream 53 must be re-synchronized with annotation stream 55 before stream 55 becomes output. In this case, stream 53 is diverted over path 65 into server 63 and delayed until it is synchronous with stream 55 before it exits server 63 over path 67. In this way, streams 55 and 53 remain synchronous on output from the authoring system.

In an alternate embodiment, synchronic delay may be performed in a separate server (not shown). The video stream that is output from system 51 (stream 53) remains essentially unchanged from the video that is input into the system (stream 49) unless the medium of transport of the video stream requires a different video resolution or frame rate. Although it has been previously described that a preferred arrangement for an authoring station such as authoring station 61a is a PC/VDU with a CPU running at least 266 MHz and a Windows platform, it will be apparent to one with skill in the art that other platforms may be used such as a Sun Microsystems workstation,

UNIX operating systems, and so on. In the case of differing platforms, differences in functional software architecture will also be apparent.

It will also be apparent to one with skill in the art that video stream outputs which ultimately remerge as stream 53 may be transferred to server 63 and delayed for synchronous purposes and so on, without departing from the spirit and scope of the present invention. In the latter case, it is conceivable as well that if both streams 53 and 55 share entry into server 63, they may also be combined therein and output as one annotated video stream.

Fig. 9 is a block diagram illustrating an exemplary modular architecture of a single authoring station according to an embodiment of the present invention. Authoring station 61 is provided and adapted to track a moving image entity in a video presentation and to provide tracking coordinates as well as other types of annotation for the purpose of soliciting responses from an end user through interactive device. Authoring station 61 is, in this embodiment analogous to station 61a of Fig. 8. Authoring station 61 utilizes various interfacing software modules in performing it's stated functions as is further detailed below.

The exemplary architecture is just one architecture through which the present invention may be practiced. A CRT module 81 is provided and adapted to display a normalized graphical bitmap image-stream as may be viewed by a person involved in an authoring procedure. A Filtergraph 72 comprises three software filters that are dedicated to performing certain functions. These are input filter 73, transform filter 75, and renderer filter 77. These three filters are responsible for receiving input video from variable sources (input filter), interpreting presented data and forming an image (transform filter), and generating and displaying the actual viewable video stream (renderer filter) comprising of a series of bitmapped frames. Within the domain of filtergraph 72, video frame speed is set at 30 FPS (exemplary), and resolution is set at 352 by 240 pixels (exemplary). This provides a compatible set of parameters for authoring station 61 which is, in this example, a PC/VDU running Windows as previously described.

Input filter 73 is adapted to accept a video input stream 71 which may be sourced from a wide variety of either analog or digital feeds. Examples are live video feeds from satellite, video camera, cable, and prerecorded video feeds from a VCR, CD-ROM, DVD, Internet server, and so on. In addition to video input, filtergraph 72 may also accept input from a user interface module 83 adapted to provide certain controls relating to filter 73 such as video conversion controls, frame rate controls and so on. Control directionality with regards to user interface 83 is illustrated via directional arrows emanating from interface 83 and leading to other components. Such controls may be initiated via keyboard command or other known method such as via mouse click, etc. Transform filter 75 interprets data for the purpose of obtaining bitmap images at a normalized resolution. Renderer filter 77 then draws the bitmap image-stream on CRT monitor 81 for viewing. In another embodiment, CRT 81 may be another type of monitor wherein pixel graphics may be viewed such as are known in the art.

A tracking module 79 (T-module) is provided and adapted to track an image and provide frame by frame tracking coordinates and to be a vehicle through which additional annotations may be provided through user interface 83. For example, through interface 83, an author may set up the parameters for tracking such as are described with reference to Fig. 5 above, as well as add additional annotation such as static or moving image icons, formatted text, , animated graphics, sounds and the like. Tracking module 79 is analogous to tracking module 13 of Fig. 1.

Renderer filter 77 is the driver that drives the video display as previously described. Tracking module 79 works in conjunction with renderer filter 77 as illustrated via opposite-facing arrows between the modules. That is, it is at this stage that image tracking and annotation operations actually take place as previously described. For example, the upward facing arrow emanating from renderer filter 77 and entering tracking module 79 represents input stream 71 (in the form of a series of bitmapped images). The downward facing arrow emanating from module 79 and re-entering filter 77 represents output stream 71 and the additional information related to the positions of the entities being tracked . The video presentation is simultaneously